

PONY

سلسلة كتب الأستاذ

SCIENCE



MAIN BOOK

4th

PRIMARY
SECOND TERM

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PONY

سلسلة كتب الأستاذ

SCIENCE

Main Book

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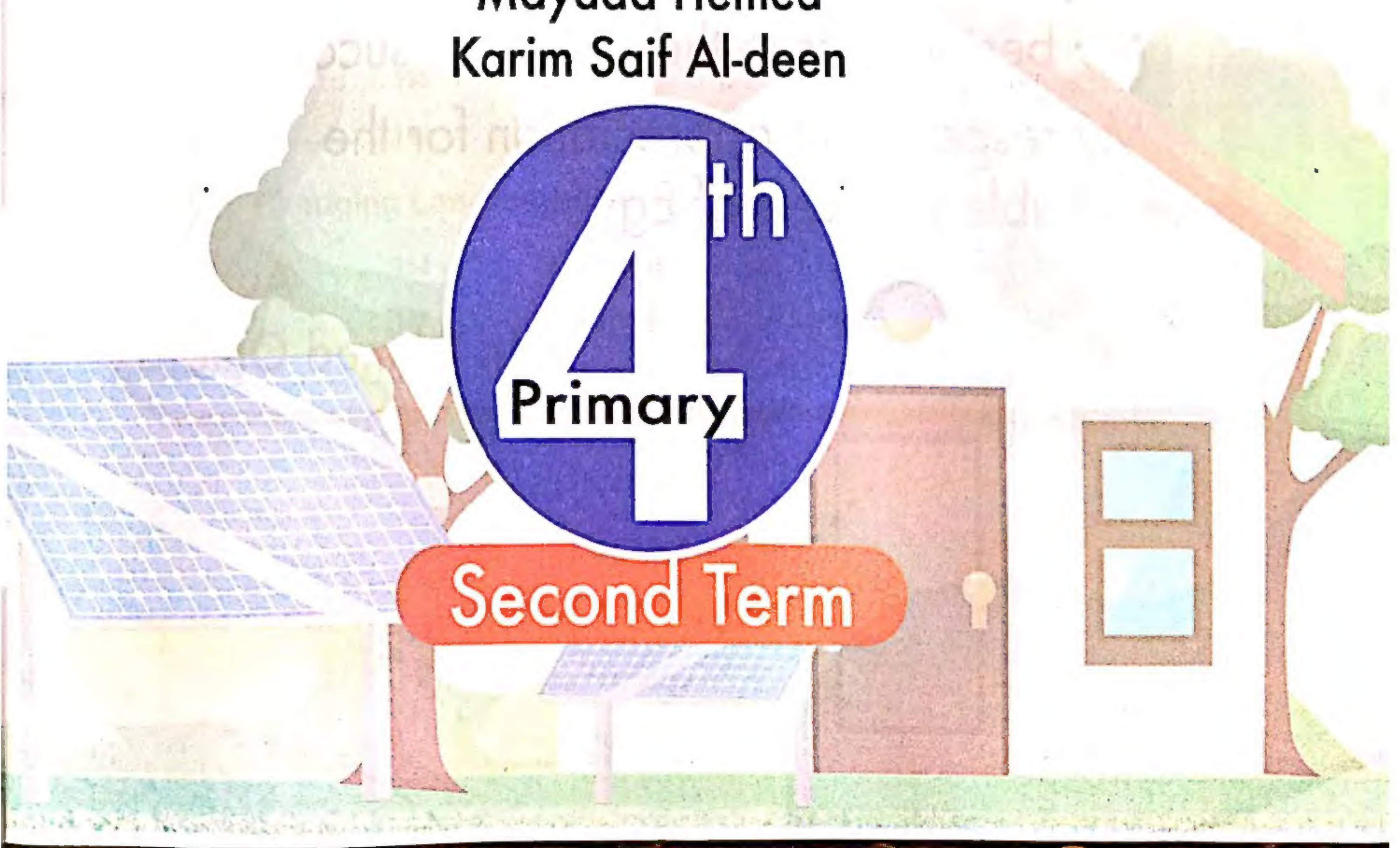
Soha Samy

Mayada Hemed

Karim Saif Al-deen

4th
Primary

Second Term



Introduction

We are proud to present to you this new educational series "**Pony**" in **Science**.

I introduce this book to our teachers and colleagues.

Also, I introduce this book to our pupils and their parents.

This book will help our pupils understand all types of questions.

We would like to know your opinions about the book, hoping it will win your admiration.

We would be grateful if you send us your comments and recommendations.

My best wishes to the pupils for success.

My respect and appreciation for the venerable teachers of Egypt.

Author,
Mr. Ahmed Omara

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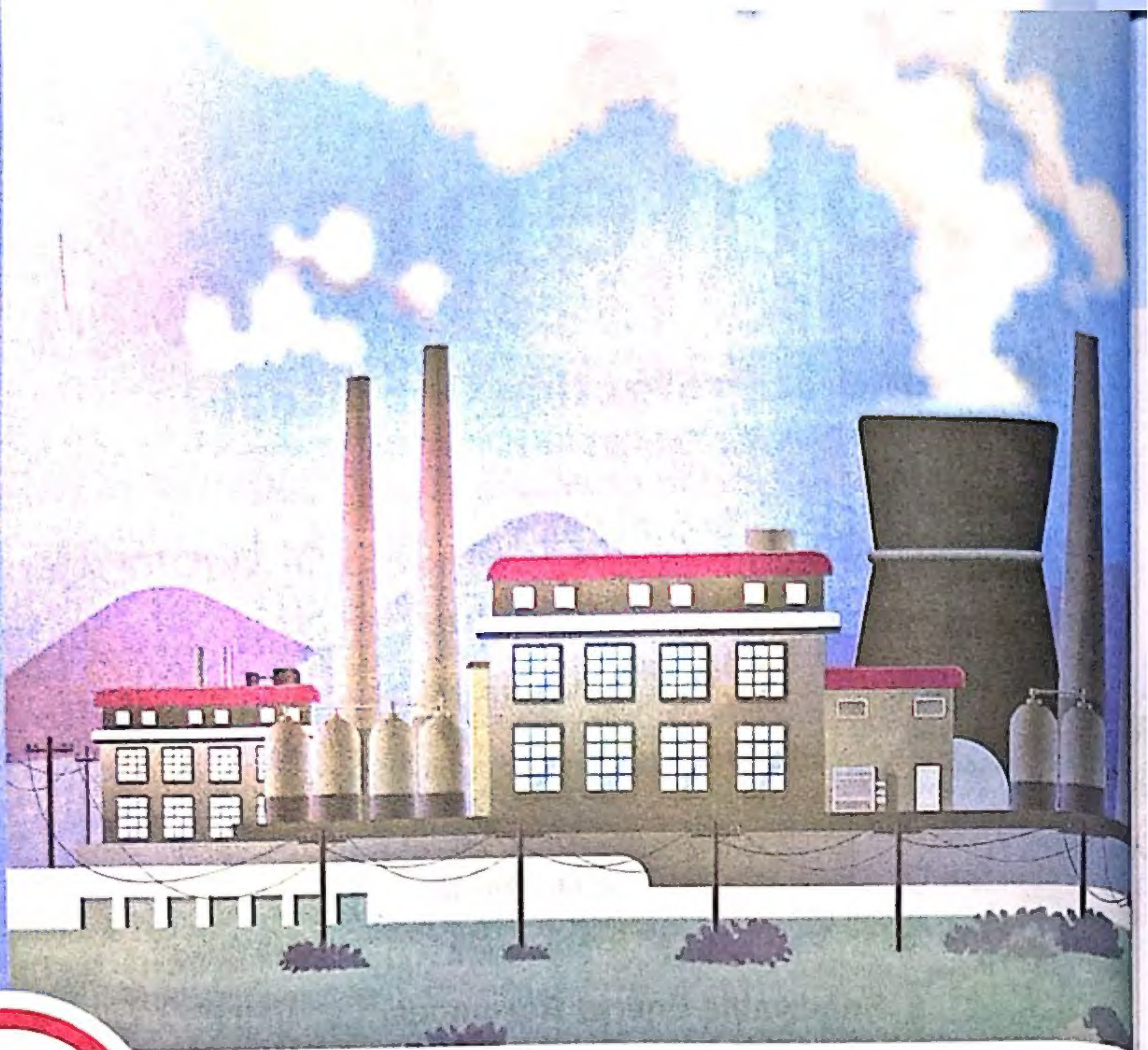
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Theme

3

Protecting
Our Planet



Unit
3

Energy and Fuel

Unit Concepts:

Concept

1

Devices and Energy

Concept

2

About Fuel

Concept

3

Renewable Energy Resources

Unit Project:

Dam Impacts

Unit Objectives

In this unit, we will study:

- 1 Energy and devices around us.
- 2 Types of fuel.
- 3 Renewable and nonrenewable sources.
- 4 How electricity is being generated in electric power station.
- 5 Using wind energy to generate electricity.
- 6 Using water of river to generate electricity.
- 7 How can we conserve energy?

Get Started

What I Already Know

» Humans use many forms of **fuel** in their daily lives, such as:

Gasoline



is used in moving cars.

Natural gas



is used in cooking.

Wood



is used in warming.

Fuel is burned in electric power stations to **generate electricity** that is used in lighting houses and operating devices.



Water for Energy

» The **moving water** has **kinetic energy**, that can be used to produce energy.

Watermills



- In the **past**, people have used moving water to turn the wheels of watermills to create energy to move machines.

Dams



- In **modern time**, dams are used to increase the kinetic energy of water.
- Fast-moving water is used to turn large turbines to generate electricity.



Concept

1

Devices and Energy

Concept Objectives:

By the end of this concept:

- ▶ Students can develop models based on observations that describe how everyday devices transform energy.
- ▶ Students can use observations and evidence to explain how energy is transferred from one place to another.

Key Vocabulary:

- Chemical energy
- Energy transfer
- Energy conservation
- Energy source
- Sun
- Earth

Concept 1

Devices and Energy

Lesson 1

- | | |
|------------|----------------------------------|
| Activity 1 | Can You Explain? |
| Activity 2 | Energy in Remote-Controlled Cars |
| Activity 3 | Mars Rover |

Lesson 2

- | | |
|------------|--|
| Activity 4 | What Do You Already Know About Devices and Energy? |
| Activity 5 | Energy Chains |

Lesson 3

- | | |
|------------|-----------------------------|
| Activity 6 | Energy and Everyday Devices |
| Activity 7 | The Conversation of Energy |

Lesson 4

- | | |
|-------------|--|
| Activity 8 | Follow the Flow |
| Activity 9 | Build an Energy Chain |
| Activity 10 | Record Evidence Like a Scientist
Energy in Remote-Controlled Cars |

Lesson



Activity 1 Can You Explain?

» We have learned that,

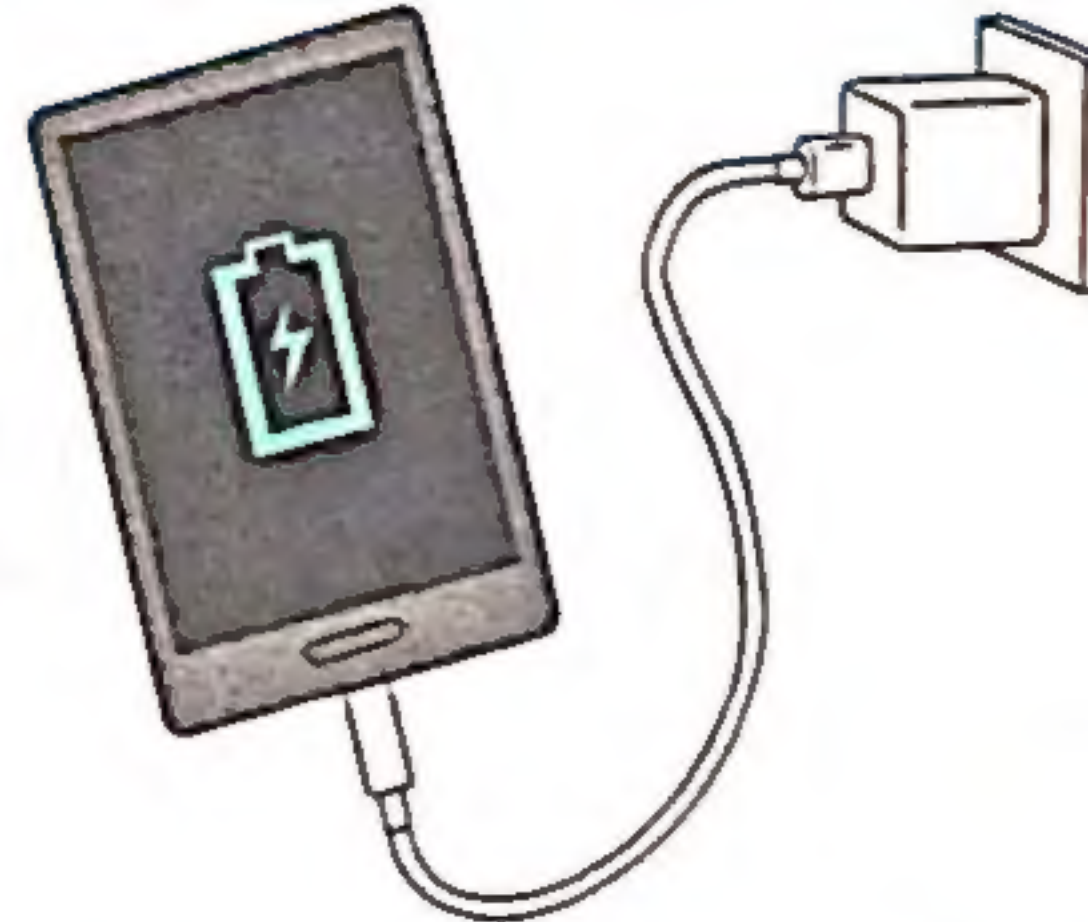
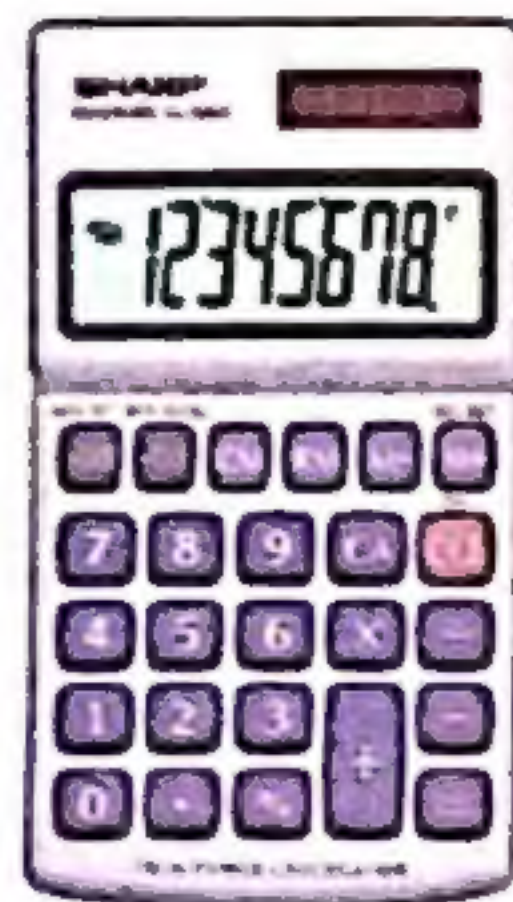
- Energy can be **changed** from one form to another.
- Most devices in our houses need **electricity**.



Technology can help us turn light energy from the Sun into different forms of energy.

• تساعدنا التكنولوجيا على تحويل الطاقة الضوئية من الشمس إلى صور مختلفة من الطاقة.

- **Solar cells** can convert solar energy into electrical energy to operate many devices, such as **calculators** and **mobile phones**.



• تقوم الخلايا الشمسية بتحويل الطاقة الشمسية إلى طاقة كهربائية؛ لتشغيل العديد من الأجهزة مثل: الآلات الحاسبة والتليفونات المحمولة.



Check your understanding?

» Put (✓) or (X):

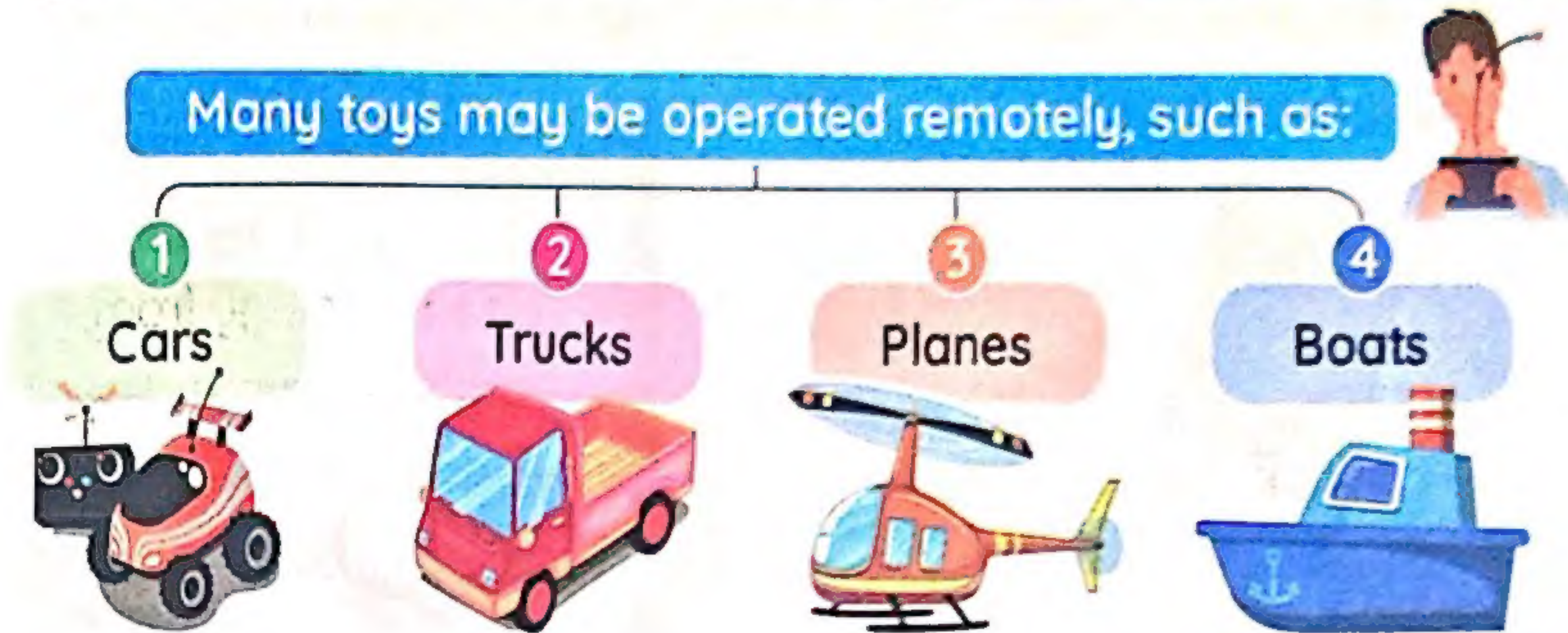
- 1 Most of the energy we use every day comes from the Sun. ()
- 2 Solar energy is a clean source of energy. ()
- 3 Solar-powered calculators use electricity. ()

Activity 2 Energy in Remote-Controlled Cars

» Choose the correct answer:

- 1 Toy cars are controlled _____ from a distance. (manually - remotely)
- 2 Batteries are used to operate _____. (electric devices - some toys)

Concept 1

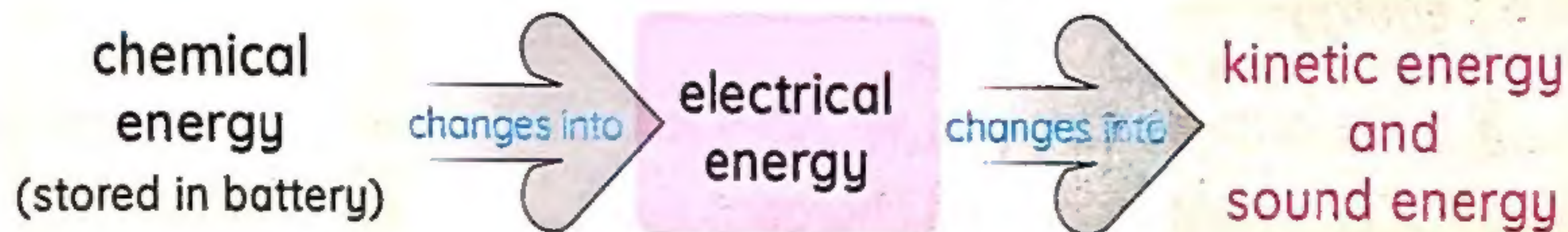


» All of these toys need **energy** and use **electricity** to move and do tasks, such as turning corners, moving their arms, or operating cameras.

- تعمل العديد من الألعاب بالتحكم عن بُعد مثل: السيارات والشاحنات والطائرات والمراكب.
- كل هذه الألعاب تحتاج إلى طاقة وتستخدم الكهرباء للتحرك والقيام بمهام مثل: الانعطاف وتحريك الأذرع أو تشغيل الكاميرات.

How do these toys get energy ?

- Toys need a source of energy to operate, such as **batteries**.
- Batteries store **chemical energy** inside them.
- When toys are operated;



- تحتاج الألعاب إلى مصدر للطاقة مثل البطاريات لتعمل.
- تخزن البطاريات طاقة كيميائية بداخلها.
- عندما يتم تشغيل اللعبة، تتحول الطاقة الكيميائية إلى طاقة كهربائية، والتي يتم تحويلها إلى طاقة حركية أو صوتية.

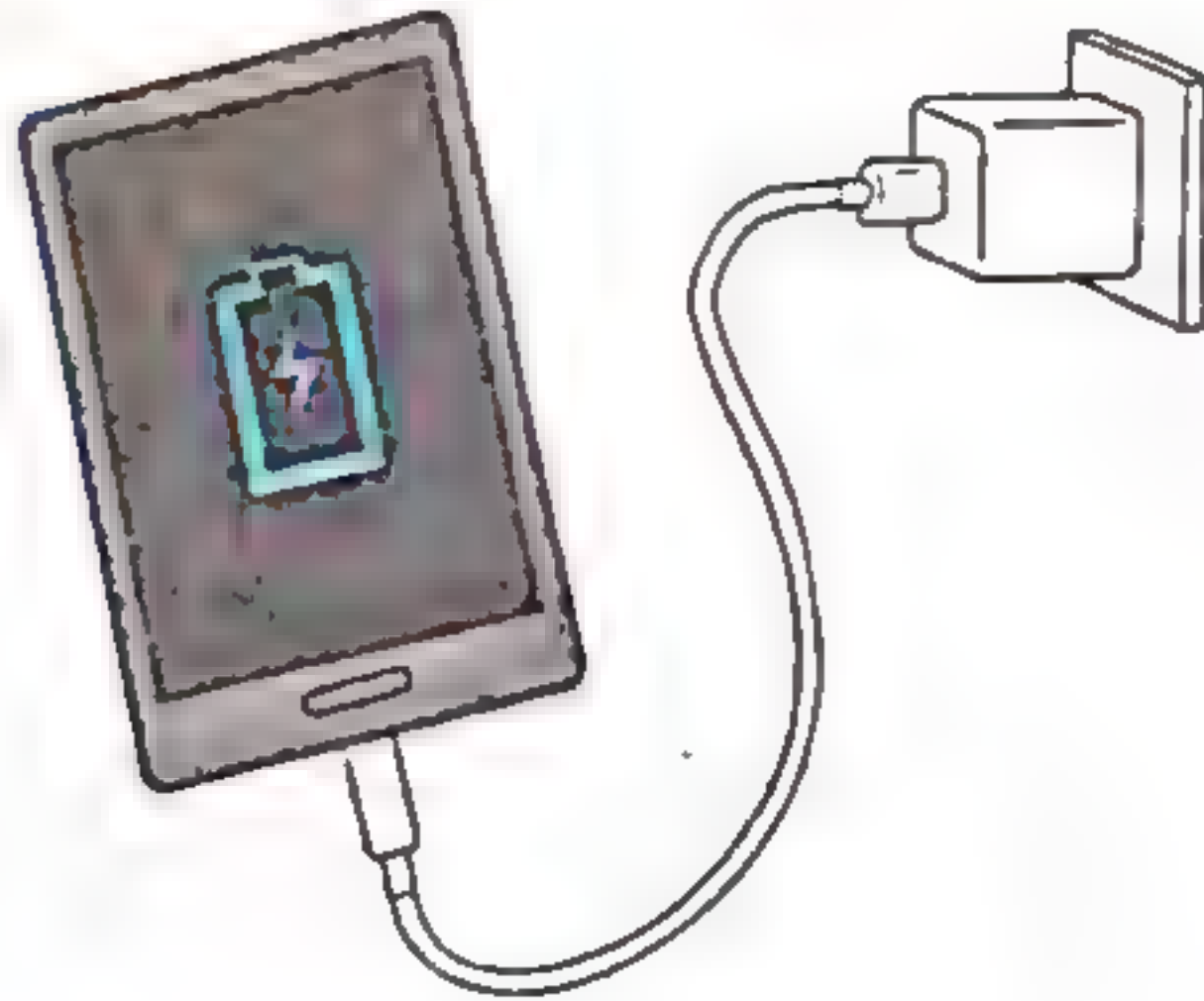
What can we do when the batteries of toys run out?



Batteries can be

1 Recharged

- By plugging the device into the nearest charger.



2 Replaced

- With new ones from a store.



• عند نفاد شحن البطاريات يمكننا:

- 1 شحنها عن طريق توصيلها بأقرب مقبس.
- 2 استبدالها عن طريق شراء بطاريات جديدة من أحد المتاجر.



Check your understanding?

» Fill these gaps with the correct words:

(electrical - kinetic - sound - chemical - replace - recharge - Energy)

- 1 _____ can be changed from one form to another.
- 2 When a toy car is operated, _____ energy inside the battery changes into _____ energy, then into _____ energy or _____ energy.
- 3 If the battery runs out, we have to _____ it with a new one or _____ it into a nearby charger.



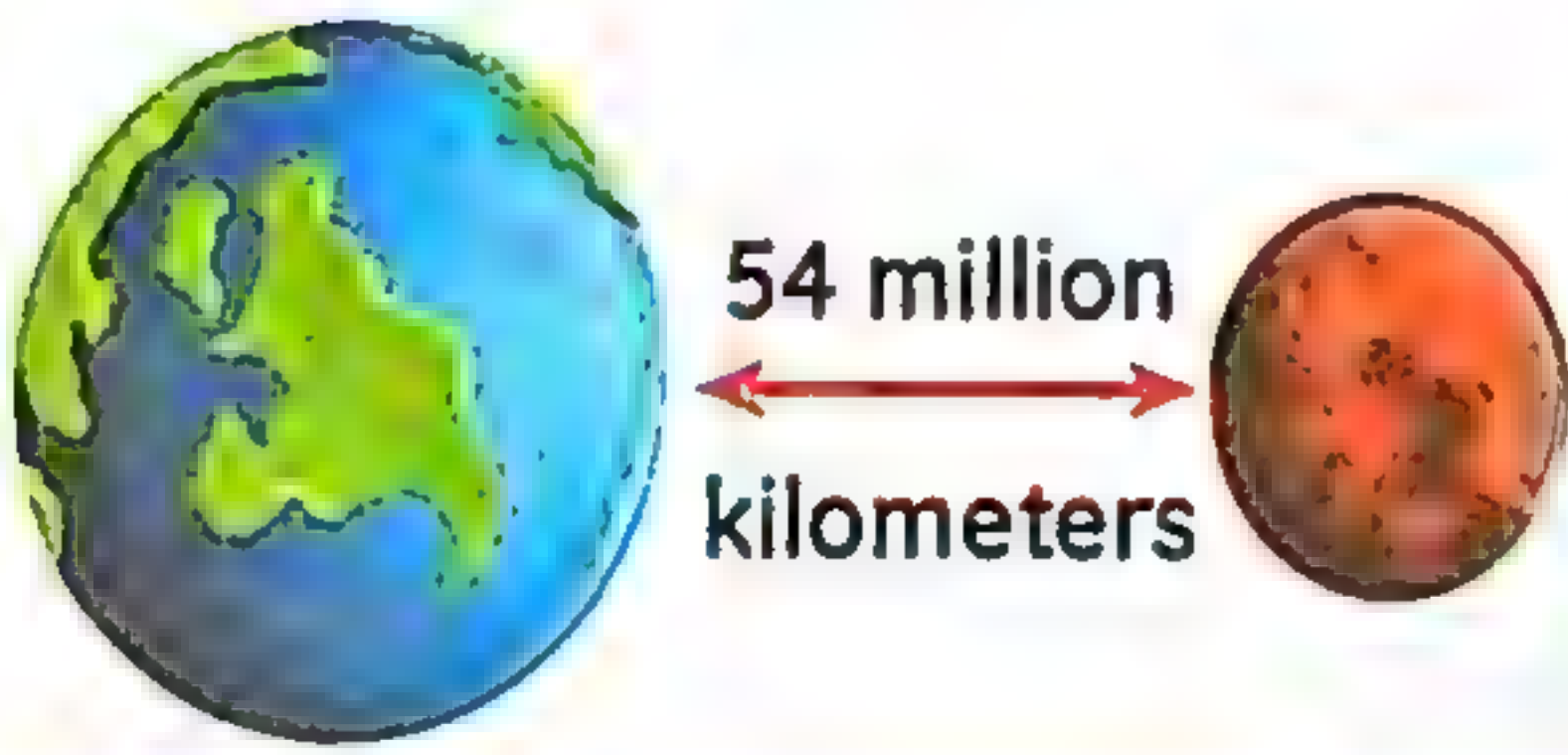
Discuss with your students the importance of batteries in operating some devices.



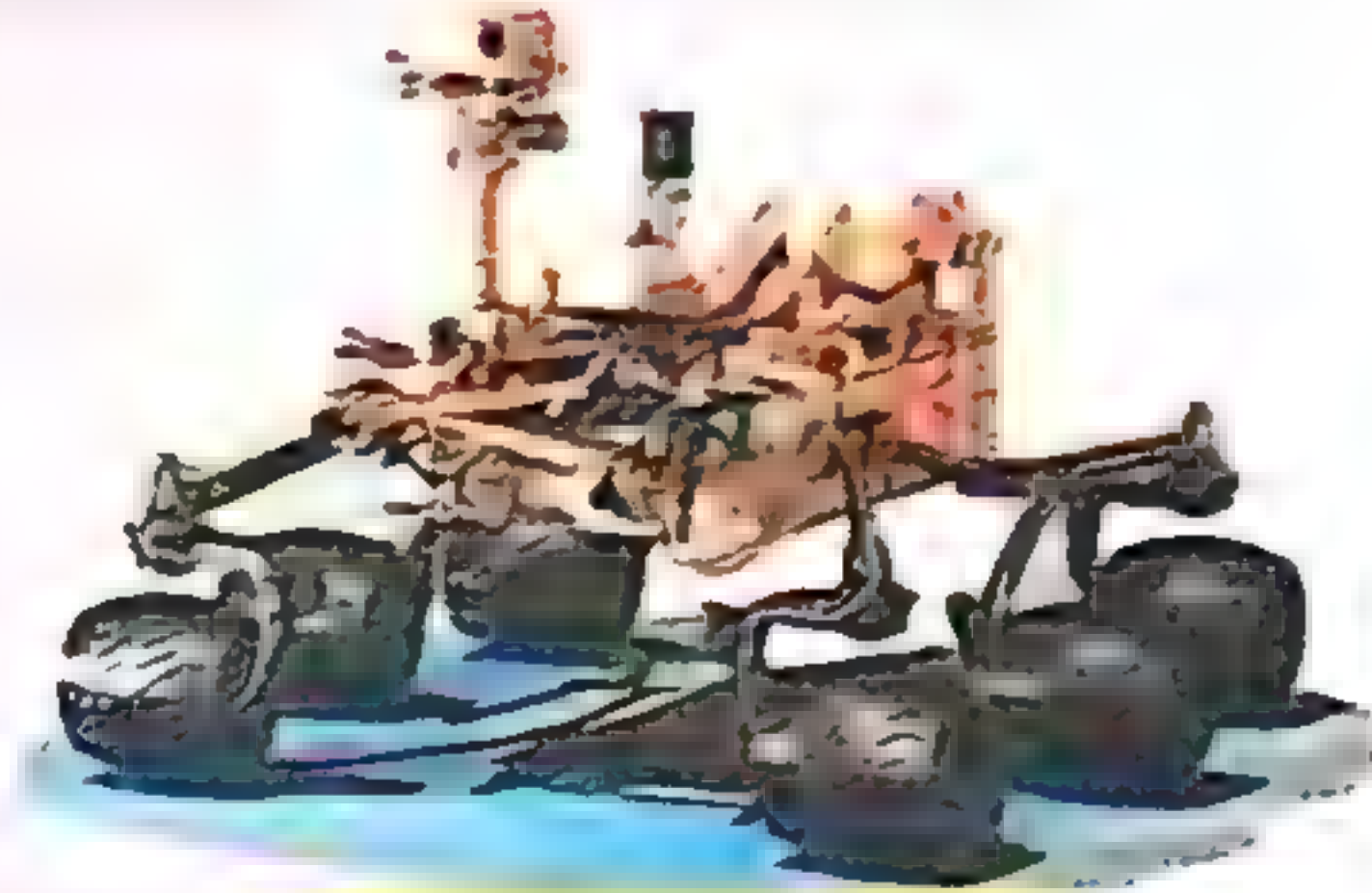
Activity 3 Mars Rover

- »» The distance between Earth and Mars is about 54 million kilometers.
- »» A spacecraft takes six months or more to reach Mars.
- »» In the past few years, humans have sent many missions to Mars using robots and vehicles operated remotely and none of these missions included people.

Concept 1



Distance between Earth and Mars



Curiosity Rover

- »» One of the most famous robots on Mars is the Curiosity Rover.
- »» Like remote-controlled toys, these rovers need energy.



The batteries used in the toys cannot be used in these robots. Because robots on Mars are too far from local stores or sockets (plugs) on Earth.

- المسافة بين الأرض والمريخ تبلغ حوالي ٥٤ مليون كيلومتر.
- تستغرق المركبة الفضائية حوالي ستة أشهر أو أكثر لتصل إلى كوكب المريخ.
- في الماضي، أرسل البشر العديد من البعثات إلى المريخ بواسطة الروبوتات والمركبات التي يتم تشغيلها عن بُعد، ولم تضم تلك البعثات أشخاصاً.
- من أشهر تلك الروبوتات Curiosity Rover.
- كالألعاب التي تعمل بالتحكم عن بُعد، تحتاج تلك الروبوتات إلى مصدر للطاقة.

How does Curiosity Rover get energy?



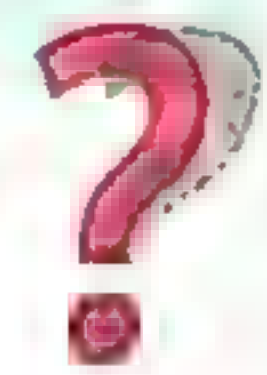
Curiosity Rover Uses

Solar Energy

Long-lasting Batteries

Enrichment information:

How does the Curiosity Rover move and explore Mars?



- » Solar panels on the rover convert solar energy into energy to charge the rover's batteries.
- » Electrical energy from the batteries powers the rover's sensors, and electrical energy is converted into thermal and kinetic energies as the rover moves and explores Mars.

• تعمل الألواح الشمسية الموجودة في العربة على تحويل الطاقة الشمسية إلى طاقة كهربائية تُستخدم لشحن بطاريات العربة.
• تقوم الطاقة الكهربائية في البطارية بتشغيل المستشعرات، وتتحول الطاقة الكهربائية إلى طاقة حرارية وحركية تُمكن العربة من الحركة واكتشاف المريخ.



Check your understanding?

» Put (✓) or (X):

- 1 Operating remotely means being controlled from a distance. ()
- 2 It is easy to replace the batteries of the Curiosity Rover. ()
- 3 Some of the exploration missions to Mars contain humans. ()
- 4 Curiosity Rover is used to explore the moon. ()

Exercises on Lesson 1

1 Choose the correct answer:

- 1 Energy can be from one form to another.
a. changed b. destroyed c. created d. b and c
- 2 Most toys depend on as a source of energy.
a. water b. batteries c. fuel d. food
- 3 toys can be operated remotely from a distance.
a. Car b. Plane c. Boat d. All the previous
- 4 Batteries store energy inside them.
a. chemical b. electrical c. solar d. kinetic
- 5 Batteries can be by electricity.
a. changed b. charged c. replaced d. converted
- 6 In a battery of a toy car, energy is changed into electrical energy.
a. thermal b. chemical c. sound d. light
- 7 Curiosity Rover is designed to explore
a. the Sun b. the moon c. Mars d. Earth
- 8 The distance between Earth and Mars is about million km.
a. 45 b. 55 c. 54 d. 540
- 9 We can convert the solar energy into energy inside the solar panels.
a. kinetic b. thermal c. electrical d. sound
- 10 Which of the following is considered energy?
a. Air b. Fuel c. Water d. Electricity
- 11 Both toy cars and Curiosity Rover
a. use solar energy b. explore Mars
c. are controlled remotely d. use the same batteries

2 Put (✓) or (X):

- 1 Energy can't be transformed from one form to another. ()
- 2 Technology helps us turn light energy from the Sun into different forms. ()

- 3 When a toy is operated, chemical energy is produced. ()
- 4 If the battery of your mobile runs out, you must replace it. ()
- 5 Mars Rover and toy cars can be operated from a distance. ()
- 6 Mars is located a few kilometers away from Earth. ()
- 7 All missions sent to explore Mars in the last decade included people. ()
- 8 It takes several days for a spacecraft to reach Mars. ()

3 Write the scientific term:

- 1 A robotic vehicle that is used to explore the surface of Mars. ()
- 2 The form of energy that is stored in the battery. ()
- 3 A tool on Mars rover that enables it to get energy. ()
- 4 The source of energy used to operate Curiosity Rover. ()

4 Complete the following using the words between the brackets:

(sound - sensors - electrical - replace - recharge - chemical - kinetic)

- 1 A battery stores _____ energy inside it, while it produces _____ energy.
- 2 To keep playing with your toy car, you must _____ it with a new one.
- 3 Electrical energy from the batteries powers the Mars Rover's _____.
- 4 When a toy car is operated, electrical energy is changed into _____ energy or _____ energy.

5 Choose from column (A) what suits it in column (B):

A

Column (A)	Column (B)
1 Curiosity Rover	a. can't be changed from one form to another.
2 Remotely-controlled toy cars	b. can be converted into another form.
3 Energy	c. depends on solar panels to get needed energy.
	d. depend on small batteries to get their energy.

- 1 _____ 2 _____ 3 _____

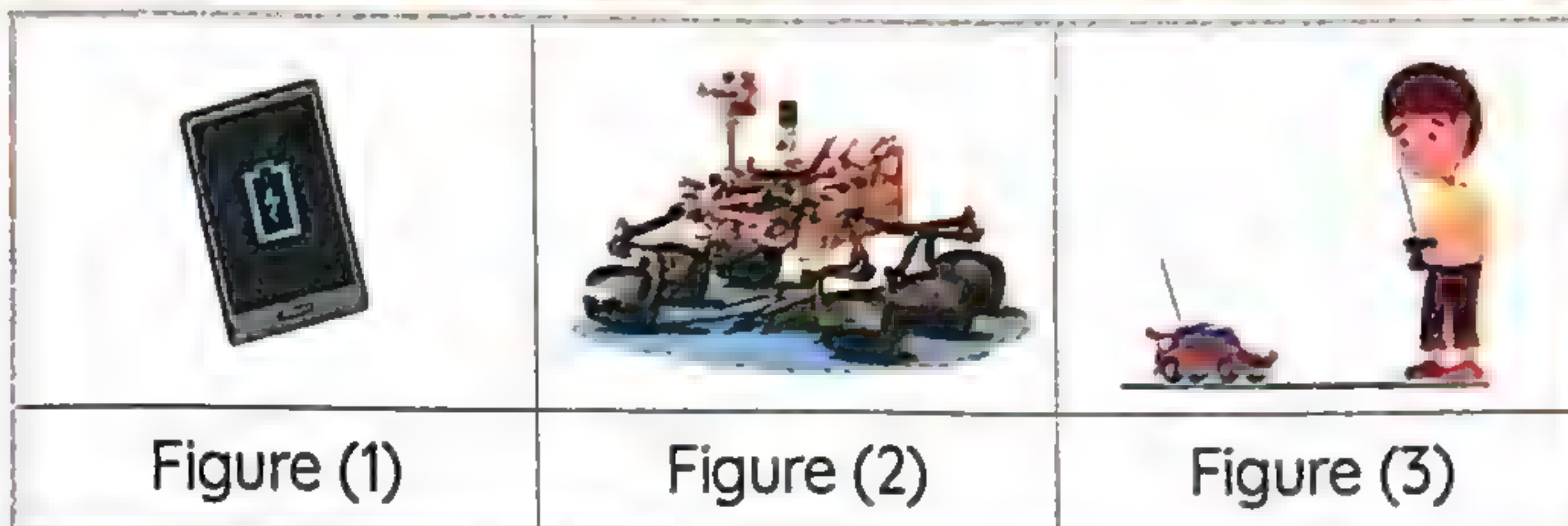
B

Column (A)	Column (B)
1 Solar energy	a. it is the source of energy for Curiosity Rover.
2 Chemical energy	b. it is produced when the toy car is operated.
3 Kinetic energy	c. it is stored inside a battery.

1 _____ 2 _____ 3 _____

Concept 1

6 Study the following figures, then complete the following questions:



- The batteries of figure (____) are too far from any plugs or stores.
- The batteries of figure (____) can be recharged from wall socket.
- The batteries of figure (____) can be replaced by new batteries.
- Figures (____) and (____) can be controlled from a distance.

7 Give reasons for:

- Toy cars need a source of energy.

- Mars Curiosity Rover needs a source of energy.

- The batteries used to operate toys can't be used in operating the Mars Rover.

8 What happens if?

- The battery of a drone is exhausted?

- Mars Rover's batteries were not recharged?

Lesson

2

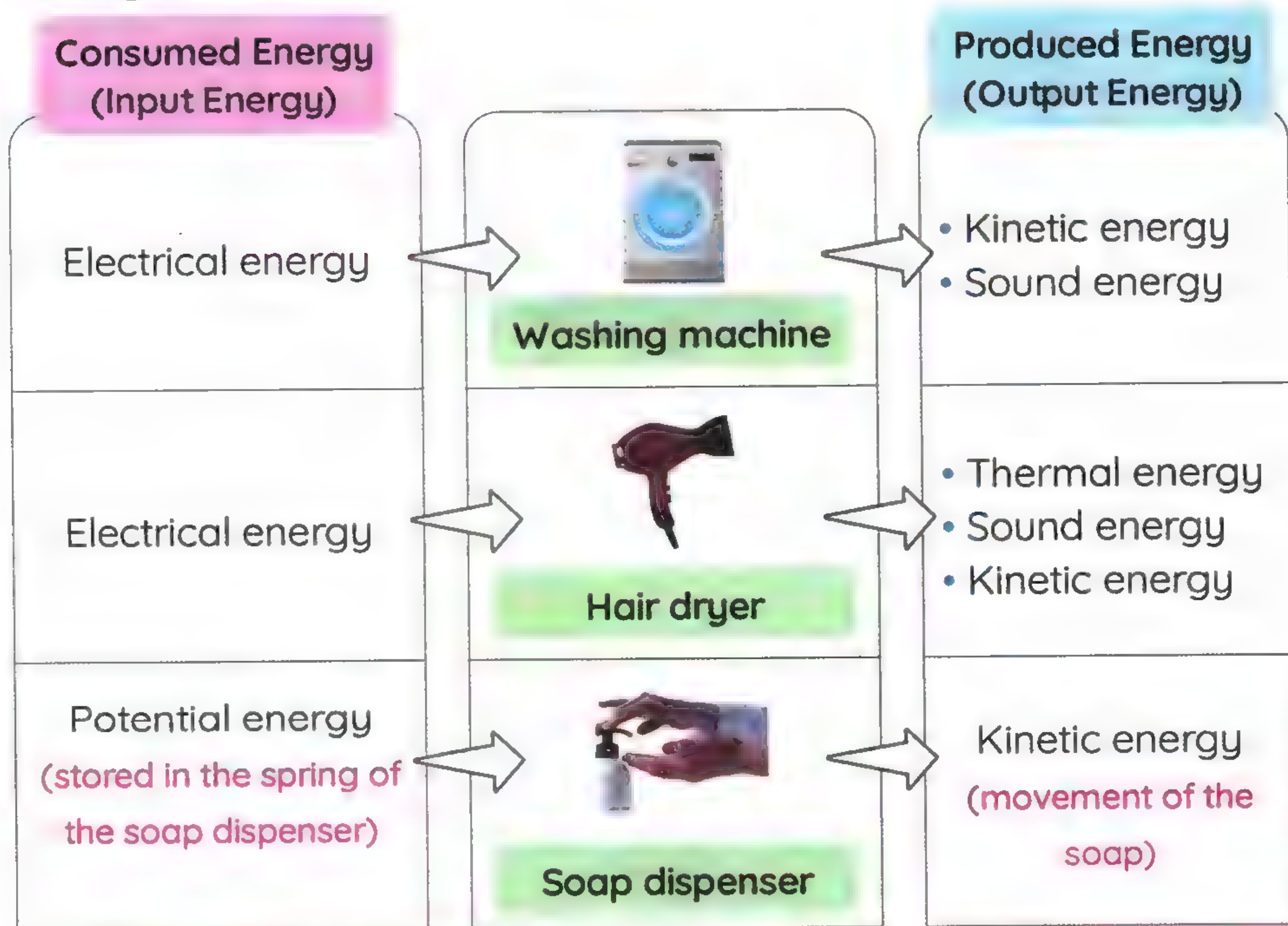


Activity



What Do You Already Know About Devices and Energy?

» Let's think about how different devices get energy and how the energy changes.



Input energy:
it is the energy
consumed in the device.

Output energy:
it is the energy
produced from the device.



Check your understanding?

» Put (✓) or (X):

- 1 Sound energy is consumed in radio. ()
- 2 Electrical energy is the output energy of solar panels. ()

Activity 5 Energy Chains

- » The Sun is considered the **main source** of energy for all devices we use.
- » **Energy chains** show the path of energy from the Sun to different devices.

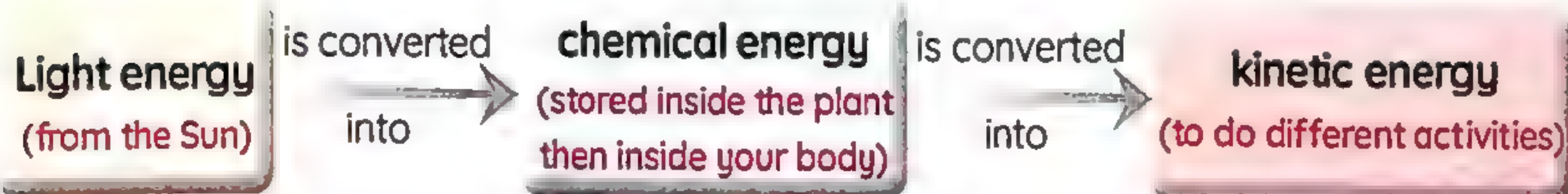
Concept 1

تُعتبر الشمس هي المصدر الرئيسي للطاقة لجميع الأجهزة التي نستخدمها.
تساعدنا سلاسل الطاقة على معرفة مسار الطاقة من الشمس وصولاً للأجهزة المختلفة.

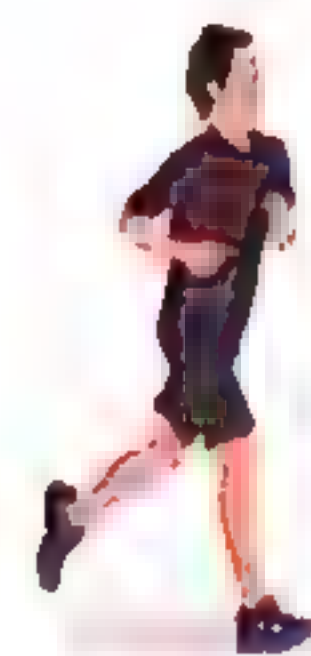
1 Energy chain when eating food, such as an orange



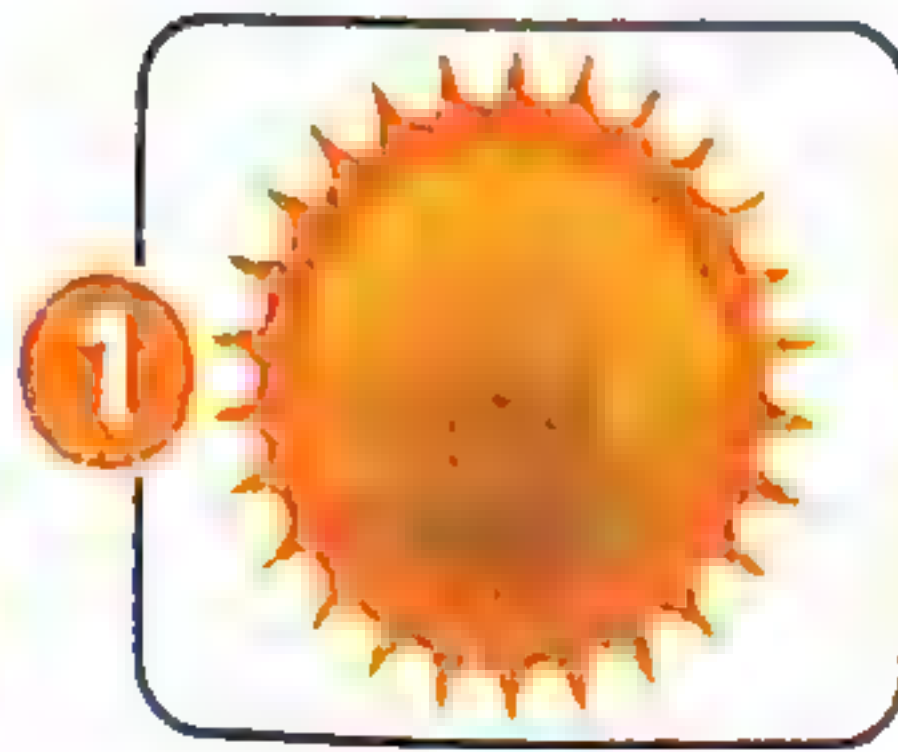
- 1 تُصدر الشمس طاقة تصل إلى الأرض في صورة ضوء وحرارة.
2 يُحوّل النبات الطاقة الضوئية من الشمس إلى طاقة كيميائية مخزنة في صورة مواد سكرية.
3 عند تناول البرتقالة يقوم جسمك بتخزين الطاقة الكيميائية ويُحوّلها لطاقة حركية عندما تتحرك.



During running, there is a **change of energy inside your body**. Because the chemical energy stored in the food is converted into kinetic energy that helps your body move.



2 Energy chain when heating a pot of water over a fire



1 Light energy that comes from the Sun causes the growth of trees.

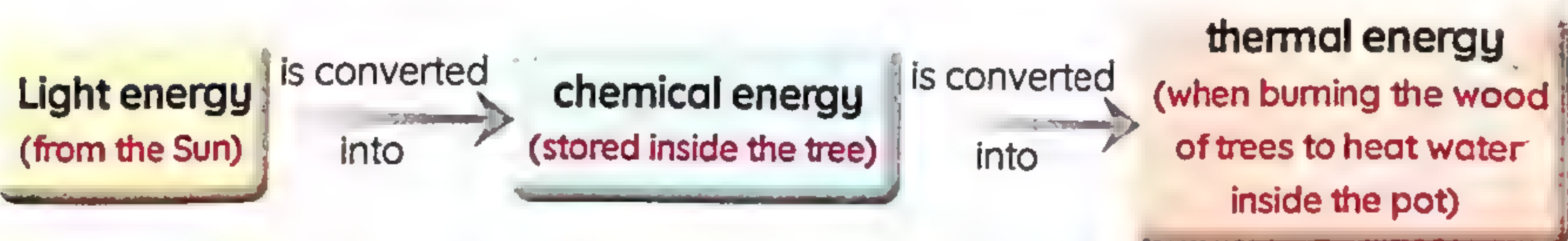


2 This plant converts the light energy of the Sun into chemical energy, which is stored inside the tree in the form of sugars.



3 When the wood of the trees is burned, thermal energy is released, which heats the water inside the pot.

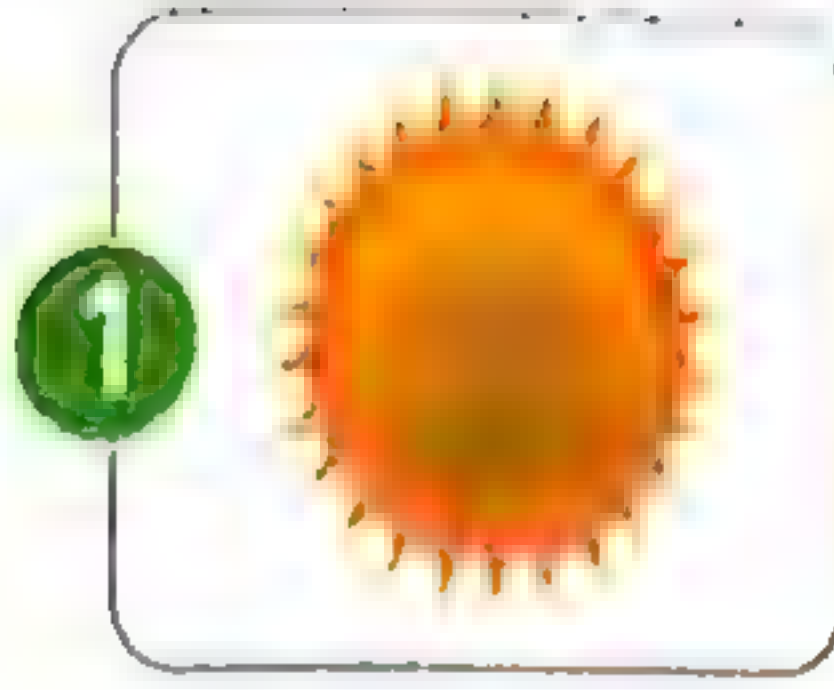
- 1 تعمل الطاقة الضوئية الصادرة من الشمس على نمو الأشجار.
2 يُحوّل النبات الطاقة الضوئية من الشمس إلى طاقة كيميائية مخزنة في صورة مواد سكرية.
3 عند حرق قطع من أخشاب الأشجار تُنتج طاقة حرارية تُستخدم لتسخين الماء في الإناء.



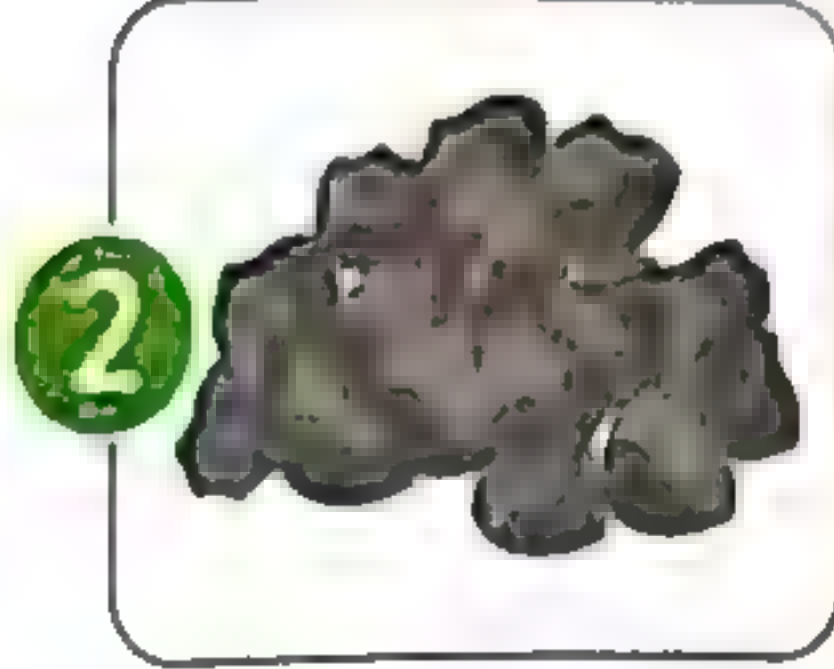
There is a change in energy when burning wood.
Because the chemical energy stored inside the wood of trees is converted into thermal energy.



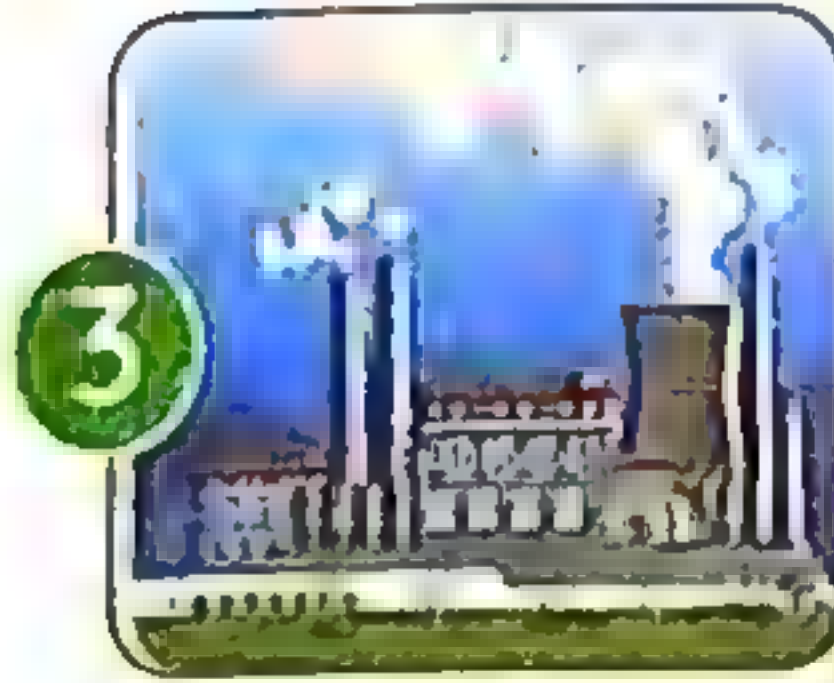
3 Energy chain in a hair dryer



» Light energy that comes from the Sun causes the growth of trees.

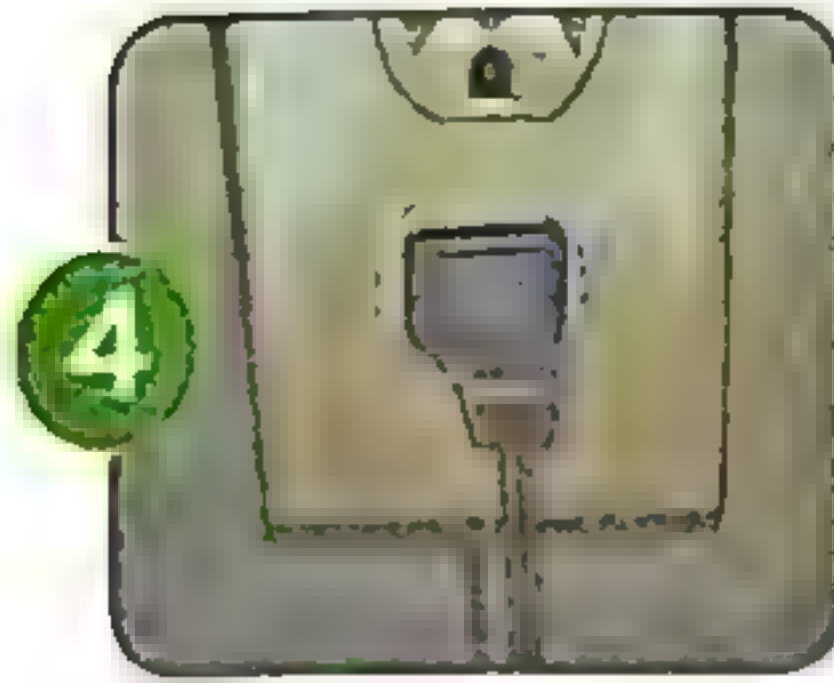


» Coal is produced from the remains of dead trees that died millions of years ago.
» Coal is a source of energy that stores chemical energy



In the electric power station:

» Coal is burned to produce thermal energy.
» Thermal energy is converted into kinetic energy.
» A certain device changes kinetic energy into electrical energy



» The electrical energy reaches the hair dryer through an electric cord (wire) made of copper.



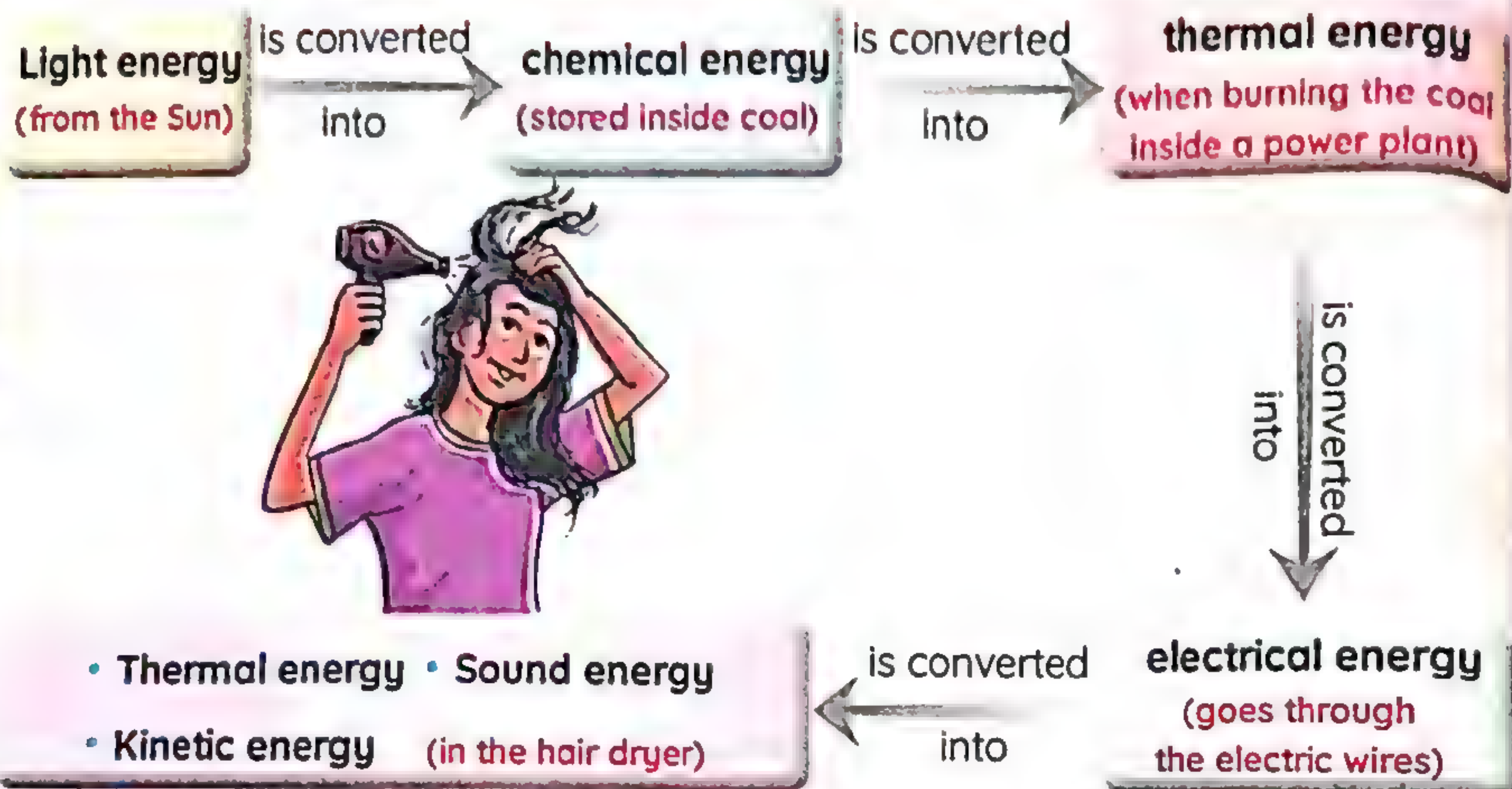
» When the hair dryer is operated, electrical energy changes into:
• Thermal energy. • Kinetic energy. • Sound energy.

Concept 1

- 1 تعمل الطاقة الضوئية الصادرة من الشمس على نمو الأشجار.
- 2 يتكوّن الفحم من بقايا الأشجار الميتة من ملايين السنين، يُعتبر الفحم من مصادر الطاقة التي تخزن بداخلها الطاقة الكيميائية.
- 3 في محطة توليد الكهرباء:
يتم حرق الفحم وتولد طاقة حرارية.
تتحول الطاقة الحرارية لطاقة حركية.
يقوم جهاز معين بتحويل الطاقة الحركية إلى طاقة كهربائية.
- 4 تصل الطاقة الكهربائية إلى مجفف الشعر عبر أسلاك تُصنع من النحاس.
- 5 عند تشغيل مجفف الشعر تتحول الطاقة الكهربائية إلى طاقة حرارية، كما تتولد طاقة صوتية وطاقة حرارية.

Energy and Fuel

The following diagram shows the energy path from the Sun to the hair



It is a way to describe the energy flow that occurs
Energy Chain: when we use different devices.

سلسلة الطاقة: هي طريقة تُوضِّح كيفية انتقال الطاقة عند استخدام الأجهزة المختلفة.



- Not all the energy in the energy chain reaches the device.
- At each link in the energy chain, some of the energy escapes as other forms that the device does not use.
- Most of the lost energy leaks out in the form of **heat**.

لا تصل كل الطاقة التي دخلت سلسلة الطاقة إلى الجهاز كما نريد.

في كل حلقة في سلسلة الطاقة، تتسرَّب بعض الطاقة في هيئة صُور أخرى لا يستخدمها الجهاز.

معظم الطاقة المفقودة تتسرَّب على شكل حرارة.



Check your understanding?

Put (✓) or (X):

- 1 Green plants store chemical energy in the form of sugar. ()
- 2 Coal is used in electric power stations to generate electricity. ()
- 3 Electrical energy can flow through wires made of wood. ()

Exercises on Lesson 2

1 Choose the correct answer:

- 1 The input energy is the energy _____ devices.
a. destroyed in b. consumed by c. produced from d. resulted from
- 2 _____ is considered the main source of energy on the Earth's surface.
a. Fuel b. The moon c. The Sun d. A battery
- 3 We can use _____ to produce thermal energy in power stations.
a. the moon b. glass c. the Sun d. coal
- 4 Some energy is lost in most devices in the form of _____ energy.
a. electrical b. thermal c. sound d. kinetic
- 5 Electric wires are made up of _____ material.
a. plastic b. wood c. iron d. copper
- 6 The input energy in Curiosity Rover is _____ energy.
a. thermal b. solar c. electrical d. kinetic
- 7 Which form of energy is not used or produced in a hair dryer?
a. Sound energy b. Thermal energy
c. Light energy d. Electrical energy
- 8 _____ energy is consumed while burning wood.
a. Thermal b. Chemical c. Kinetic d. Light
- 9 All of these energies are produced from the hairdryer, except the _____ energy.
a. sound b. thermal c. kinetic d. electrical
- 10 All of the following store chemical energy, except _____.
a. a battery b. an apple
c. a compressed spring d. coal

2 Put (✓) or (X):

- 1 Most energy chains start with the moon. ()
- 2 The energy chain of a burning candle is composed of chemical energy converted into thermal energy and light energy. ()

Energy and Fuel

Unit 3

- 3 There is stored chemical energy inside the food we eat. ()
- 4 Energy can't be transformed from one form to another. ()
- 5 Coal is produced from the remains of dead trees that died millions of years ago. ()
- 6 Plants need sunlight to grow. ()
- 7 We can use the energy of the Sun to produce electricity. ()
- 8 All the energy that enters the energy chain reaches the device completely. ()
- 9 On pressing the spring of the soap dispenser, the soap moves upward. ()

3 Write the scientific term:

- 1 The main source of energy for most forms of energies on Earth. ()
- 2 The energy produced when the wood of trees is burned. ()
- 3 The form of energy that is stored in the battery of a remote control. ()
- 4 The energy stored in plants in the form of sugar. ()
- 5 A part of the soap dispenser that stores potential energy that is changed into kinetic energy. ()
- 6 A path that shows the energy flow from its source to the device. ()

4 Complete the following sentences:

- 1 In any energy chain, some of the energy is lost in the form of _____.
- 2 The energies that are produced from the washing machine are _____ energy and _____ energy.
- 3 _____ can be used in electric power stations to generate electricity.
- 4 During running, _____ energy stored in the human body is changed into _____ energy.

Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 Chemical energy	a. it is the energy produced during running.
2 Sound energy	b. it is the input energy in a soap dispenser.
3 Kinetic energy	c. It is the produced energy from the radio.
4 Potential energy	d. It is stored inside a tree.

1 2 3 4

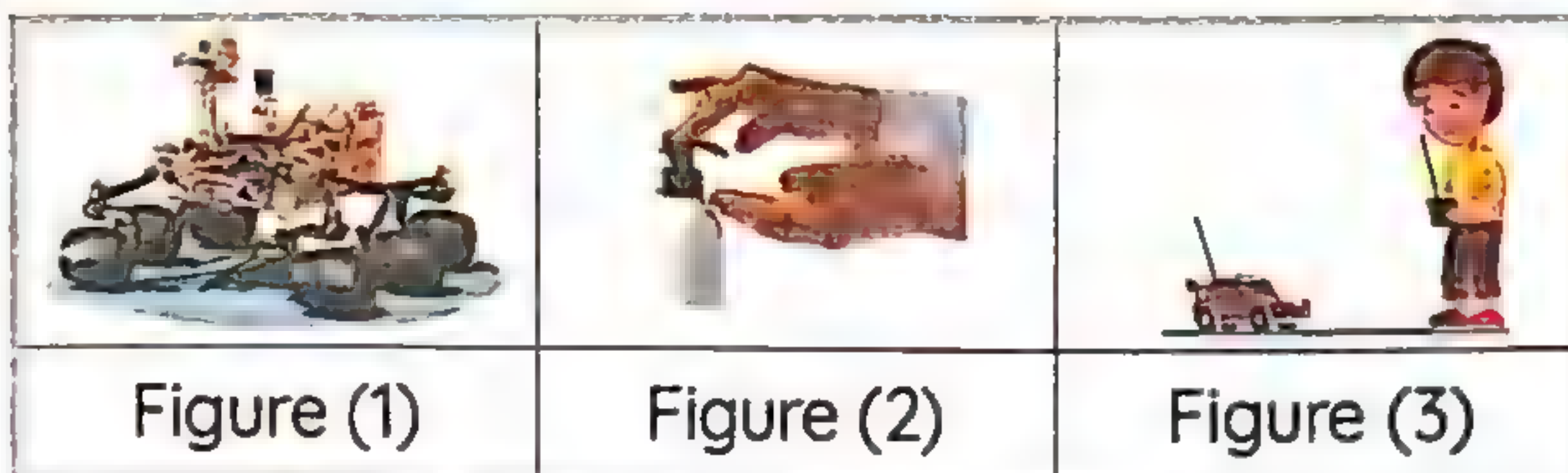
Arrange the following steps according to:

Energy chain in a hair dryer:

- a () Electricity is transferred through huge wires to cities.
- b () Trees absorb light energy and store it as chemical energy.
- c () The Sun emits light energy that reaches the Earth.
- d () Heat, sound, and kinetic energies are produced.
- e () Coal is burned in the electric power station.
- f () Electricity passes through wires to the hair dryer.

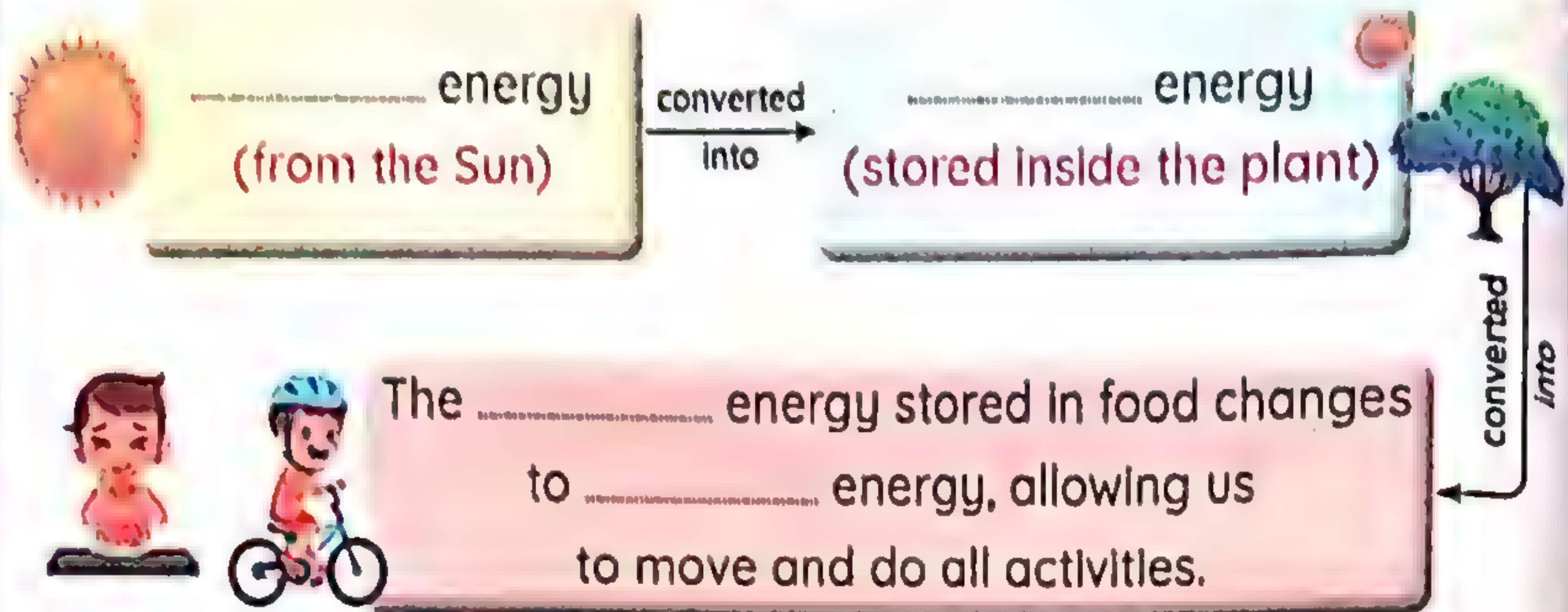


Study the following figures, then complete the following questions:



- 1 energy is the output energy in all these figures.
- 2 Figure (.....) depends on solar energy to be operated.
- 3 Figures (.....) and (.....) can be controlled from a distance.
- 4 The input energy of figure (.....) is the chemical energy stored in the battery.
- 5 The input energy of figure (.....) is potential energy.

8 Complete the following energy chain:



9 Give reasons for:

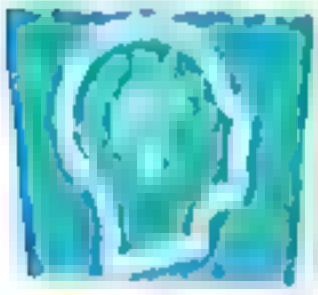
1 The Sun is considered the main source of energy for all devices.

2 Not all the energy that enters the energy chain reaches the device.

3 There is a change in energy when burning wood of trees.

4 During running, there is a change of energy happens in your body.

Lesson



Activity



Energy and Everyday Devices

Experiment




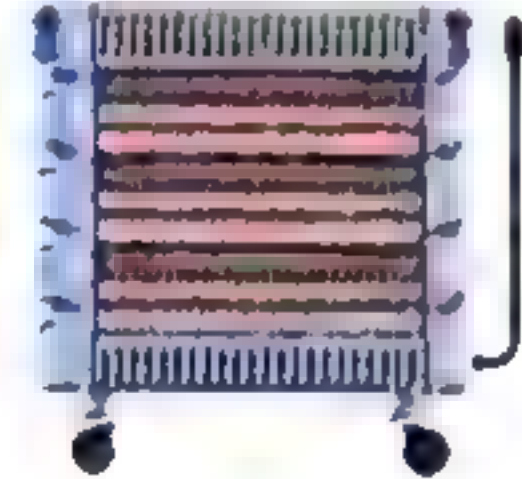


Concept 1


» In this activity, you will use what you know about types of energy to describe the input and output energies of different devices.

في هذا النشاط، سوف نستخدم ما نعرفه عن أنواع الطاقة لوصف مدخلات ومخرجات الطاقة للأجهزة المختلفة.

Tools:

			
Electric bulb	TV	Electric iron	Electric heater

		
Electric bell	Hand bell	Guitar

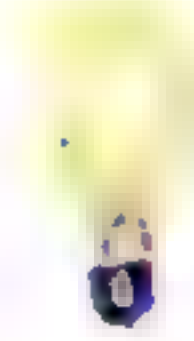






		
Toy car (it is operated by spring)	Toy car (it is operated by battery)	Watch




Steps:

- 1 Analyze each device.
- 2 Determine the input energy and output energy for each device.
- 3 Record your observations in the following table:

Results:

Unit 3

Device	Function	Input Energy Incoming/Used/ Consumed Energy	Output Energy Outcoming/ Resulted Energy
1 Electric bulb 	Lighting	Electrical energy	Light energy Thermal energy
2 TV 	Display sound and image	Electrical energy	Light energy Sound energy
3 Electric iron 	Ironing clothes	Electrical energy	Thermal energy
4 Electric heater 	Warming	Electrical energy	Thermal energy
5 Electric bell 	Alerting	Electrical energy	Sound energy
6 Hand bell 		Kinetic energy	Sound energy
7 Guitar 	Playing music	Kinetic energy	Sound energy

Device	Function	Input Energy (Energy used to operate the device)	Output Energy (Energy produced by the device)
8 Toy car (it is operated by a spring) 	Toys for kids	Potential energy (stored in a spring)	Kinetic energy
9 Toy car (it is operated by a battery) 		Chemical energy (stored in a battery)	Kinetic energy
10 Watch 	Knowing time	Chemical energy (stored in a battery)	Kinetic energy

Concept

Any device needs a source of energy to operate.

Energy can be changed from one form to another.

Some of the input energy escapes in other forms that the devices don't use to perform their functions.

يحتاج كل جهاز إلى مصدر للطاقة لتشغيله.

يمكننا تحويل الطاقة من صورة لأخرى.

تتسرب بعض مداخلات الطاقة داخل الأجهزة لصور أخرى قد لا تستخدمها الأجهزة لأداء وظائفها.



Check your understanding?

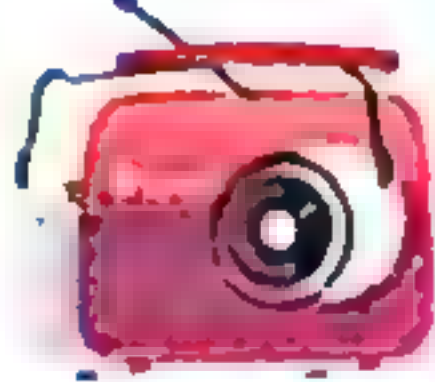






» Put (✓) or (✗):

- When you rub your hands together, kinetic energy is transformed into thermal energy. ()
- During clapping, sound energy is produced. ()

Check your understanding?



Mention the input and output energies for these devices:

Unit	Device	Function	Input Energy (According to Used/ Generated Energy)	Output Energy (According to Resulted Energy)
	1 Radio			
	2 Fan			
	3 Blender			
	4 Flashlight			
	5 Kettle			
	6 Drum			
	7 Curiosity Rover			



Activity 7

The Conservation of Energy



Put (✓) or (X):

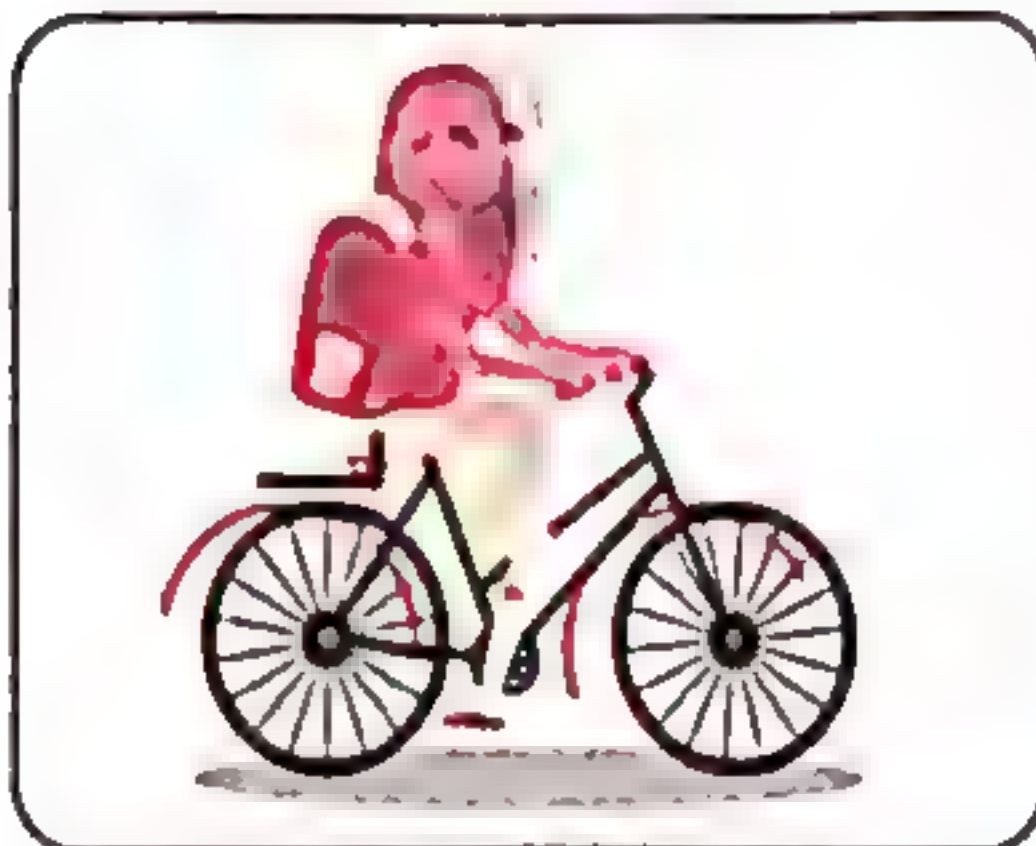
- ① Kinetic energy is produced when we let the spring of a toy car. ()
- ② A toy car that is operated by a spring depends on chemical energy. ()

- In the previous lesson, we learned that energy can be transformed easily from one form to another.
- Now, let's study some examples of energy transformation.

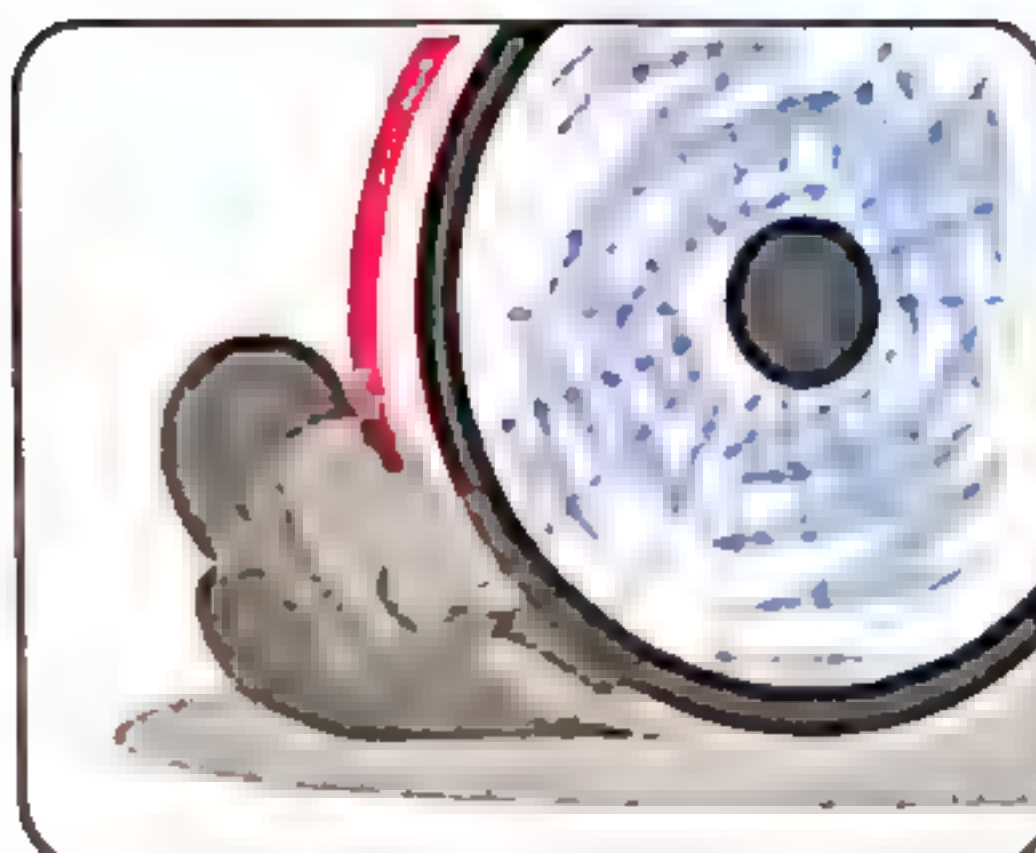
Example ① Energy chain while riding a bike



- When you eat your breakfast, the **chemical energy** stored in the food provides your body with energy.



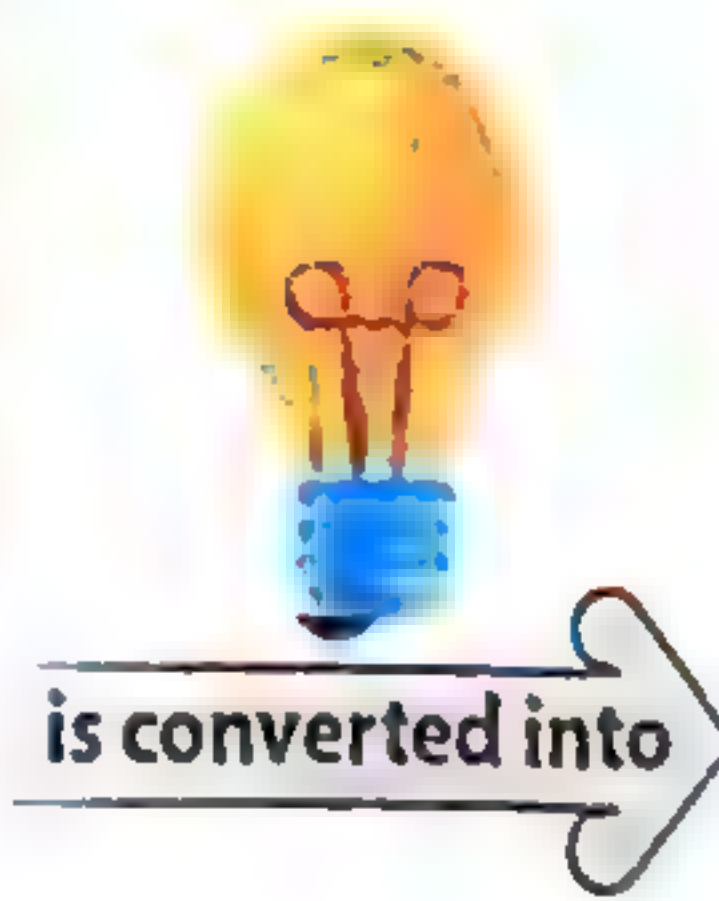
- When you push pedals, chemical energy is converted into **kinetic energy**, which moves the bike.



- A part of the kinetic energy changes to **thermal energy** due to the friction between the wheels of the bike and the road.

Example 2 Energy chain in the light bulb

• When you turn on a light bulb, the **electrical energy** that powers the light bulb.



• **Light energy**, so the room becomes brighter.
• **Thermal energy**, so you feel the heat when you approach your hand near the light bulb.

From the previous:

- » The **new energy** cannot be created from nothing.
- » The **old energy** does not disappear, but it changes from one form into another.
- » This is called " **The Law of Conservation of Energy** ".

يمكن أن تُخلَق الطاقة الجديدة من العدم (لا شيء).
طاقة القديمة لم تختفِ، لكنها تتغيَّر من صورة لأخرى.
هذا يُسمى «قانون حفظ الطاقة».

Law of Conservation of Energy

Energy is neither **created** nor **destroyed**; it can only be converted from one form to another.

قانون بقاء الطاقة: الطاقة لا تُفنى أو تُستحدث من العدم، ولكن يمكن تحويلها من صورة لأخرى.

Check your understanding?

» Put (✓) or (✗):

- 1 Thermal energy doesn't help the light bulb to do its main job. ()
- 2 Our bodies store kinetic energy that allows us to move. ()

Exercises on Lesson 3

1 Choose the correct answer:

- 1 The input energy in the fridge is energy.
a. light b. electrical c. sound d. kinetic
- 2 All the following devices produce thermal energy, except the
a. hair dryer b. watch c. kettle d. electric heater
- 3 Sound energy is produced from all the following devices, except the
a. washing machine b. hair dryer
c. mobile phone d. electric iron
- 4 The uses the thermal energy to do its function.
a. mobile phone b. washing machine
c. TV d. hair dryer
- 5 The changes electrical energy into light and sound energies.
a. washing machine b. TV
c. radio d. hair dryer
- 6 The produced energy doesn't help the blender do its job.
a. sound b. kinetic c. chemical d. potential
- 7 In all of these devices, kinetic energy is converted into sound energy except the
a. guitar b. electric bell c. hand bell d. drum
- 8 When you turn on your television, the electrical energy travels through until it reaches it.
a. wires b. air c. screens d. plastics
- 9 During riding a bike, some kinetic energy is converted into energy due to the friction of the bike's tire with the road.
a. chemical b. potential c. thermal d. electrical
- 10 During playing football, the chemical energy inside the body is converted into energy.
a. light b. kinetic c. potential d. electrical

3

Unit

2

Put (✓) or (X):

11 _____ is a lost energy in the light bulb, but it isn't in the electric kettle.

a. Light energy

b. Thermal energy

c. Chemical energy

d. Sound energy

1 Both the electric bulb and the electric heater produce thermal energy. ()

2 When you rub your hands, kinetic energy changes to heat energy. ()

3 The produced sound energy helps the blender do its function. ()

4 Thermal energy is considered the input energy of electric heaters. ()

5 Both the TV and mobile phone use batteries. ()

6 Flashlights change chemical energy into light and thermal energies. ()

7 There is energy loss when energy is transformed from one form to another. ()

8 When pedalling a bike, the chemical energy in your body changes to kinetic energy. ()

9 There is a stored chemical energy inside the food we eat. ()

10 All the energy that comes from the Sun will reach our home devices. ()

11 Energy is not necessary for some of our daily activities. ()

12 Some devices are operated without the need for energy. ()

13 The human body stores the same kind of energy inside batteries. ()

14 Kinetic energy changes to sound energy during clapping. ()

Write the scientific term:

- 1 A device used to convert electrical energy into light energy. ()
- 2 The energy produced when the wood of trees is burned. ()
- 3 The energy that is produced from the blender and helps it in doing its job. ()
- 4 The energy produced from playing the guitar. ()
- 5 The lost energy on using a computer. ()
- 6 The energy that is always produced due to friction. ()
- 7 The energy stored inside all living organisms bodies. ()
- 8 The incoming energy of the light bulb. ()
- 9 The output energy that helps the light bulb to do its main job. ()
- 10 The main source of energy on the Earth. ()
- 11 The material that electric wires are made from. ()
- 12 Energy can neither be created nor destroyed, but it's only converted from one form to another. ()
- 13 The energy produced from the electric lamp and affects your eyes. ()

4 Complete the following sentences:

- 1 The electric lamp converts _____ energy into light and heat energies.
- 2 In the electric heater, _____ energy is considered an input energy, while thermal energy is considered an _____ energy.
- 3 To operate an electric mixer, we use _____ energy.
- 4 Both sewing machine and vacuum cleaner produce _____ and _____ energies.

5 Complete the following using the words between the brackets:

(input - chemical - sound - kinetic - output - light)

- ① The mobile phone converts chemical energy stored in its battery into _____ energy and _____ energy.
- ② When you ride a bicycle, the _____ energy stored in your body is converted into _____ energy, which makes the bicycle move.
- ③ The kinetic energy in a hand bell is considered as _____ energy, while in a small watch it's considered as _____ energy.

6 Cross out the odd word:




- ① Food - Battery - Lamp - Coal (_____)
- ② TV - Mobile phone - Radio - Computer (_____)
- ③ Hairdryer - Blender - Washing machine - Light bulb (_____)

7 Choose from column (A) what suits it in column (B):

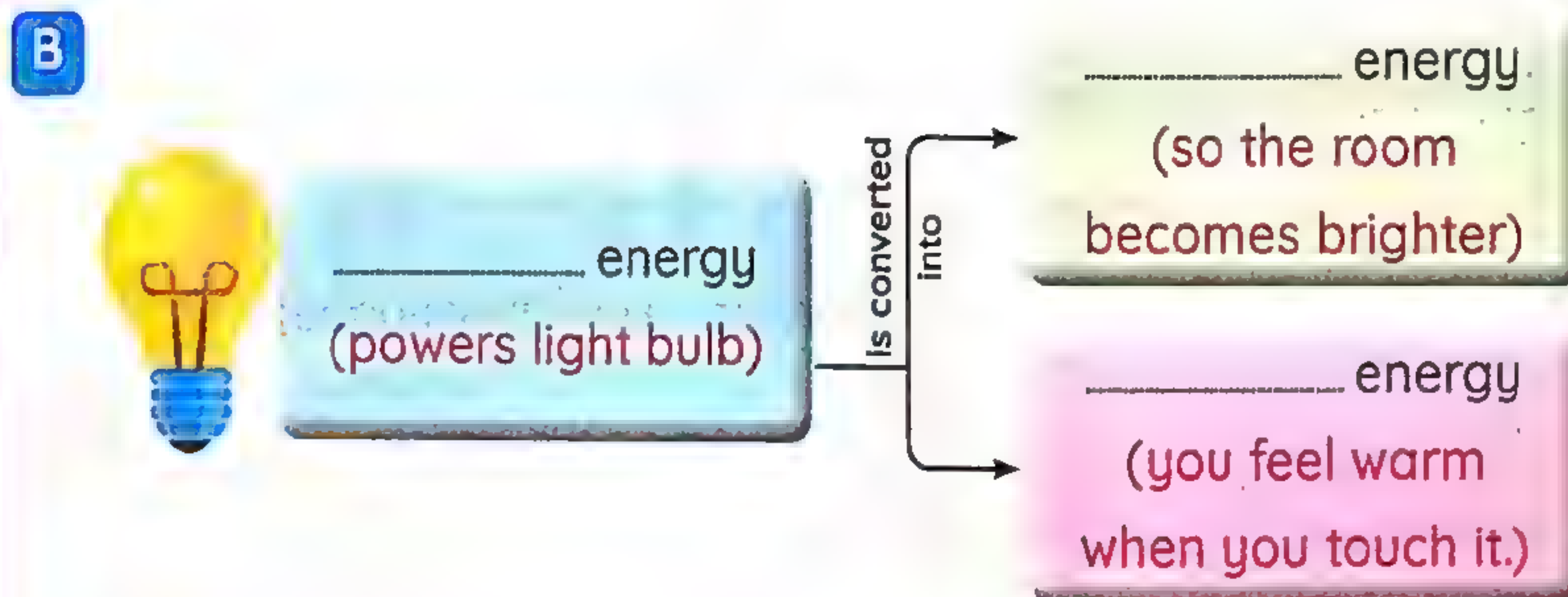
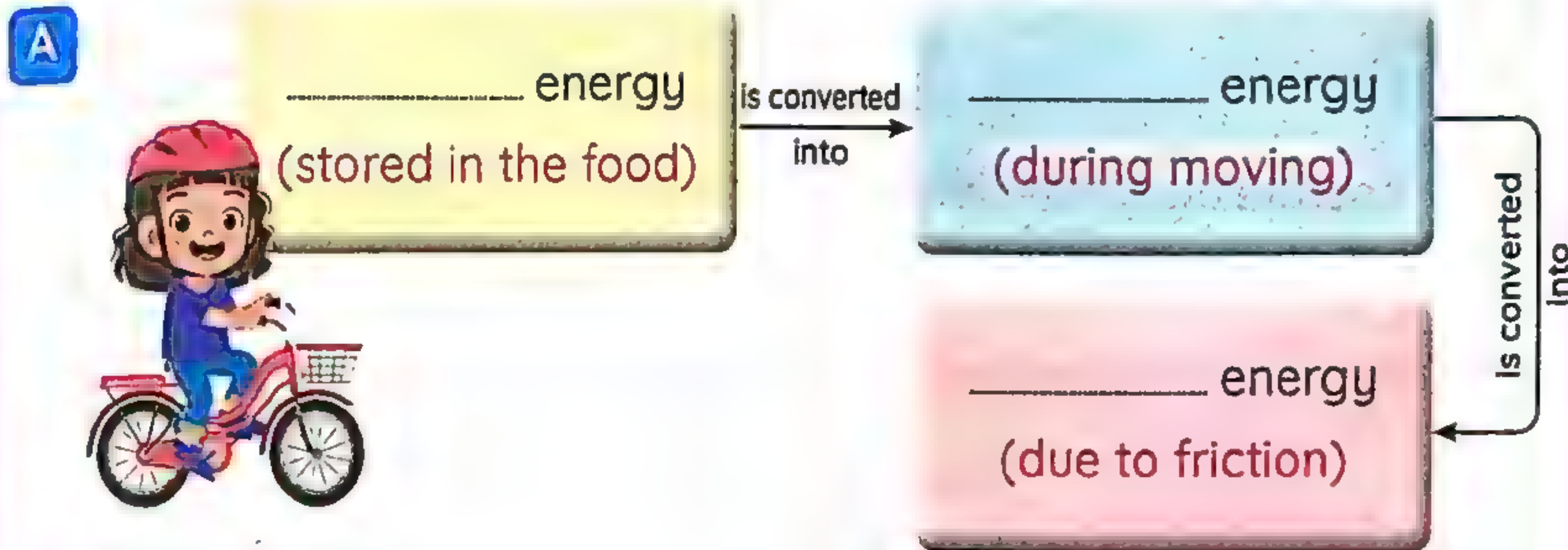
Column (A)	Column (B)
① Solar panels	a. converts the electrical energy into sound energy.
② Electric fan	b. changes the electrical energy into light and thermal energies.
③ Radio	c. changes the electrical energy into kinetic energy.
④ Electric bulb	d. changes the solar energy into electrical energy.

- ① _____ ② _____ ③ _____ ④ _____

Complete the following table:

Input Energy	Device	Output Energy
	1 	
	2 	
	3 	

Complete the following diagrams:



10

Give reasons for:

- ① You feel warm when you put your hands near a lighted light bulb.
- ② The computer gets warm when being used for a long time.
- ③ You feel warm when you touch the tire of a bike after you stop moving.

11

What happens if?

- ① You rub your hands? (according to energy changes)
- ② You switch on an electric bulb? (according to energy changes)
- ③ You operate an electric fan? (according to energy changes)
- ④ You let a toy car operated by a spring move?
(according to energy changes)
- ⑤ You operate home devices for a long time?
- ⑥ Your hand is approached to a lighted electric lamp?
- ⑦ You start pedalling the bike? (according to energy change)
- ⑧ You turn on TV? (according to energy change)

Lesson 4



Activity 8 Follow the Flow

Put (✓) or (X):

- 1 Thermal energy helps the electric bulb do its function. ()
- 2 Kinetic energy helps the blender do its main job. ()

- Energy is **conserved**. It is neither created nor destroyed.
- All the energy that goes into a device must eventually leave it in a different form.
- The energy that **goes in** the device is called "Input energy".
- The energy that **comes out** the device is called "Output energy".

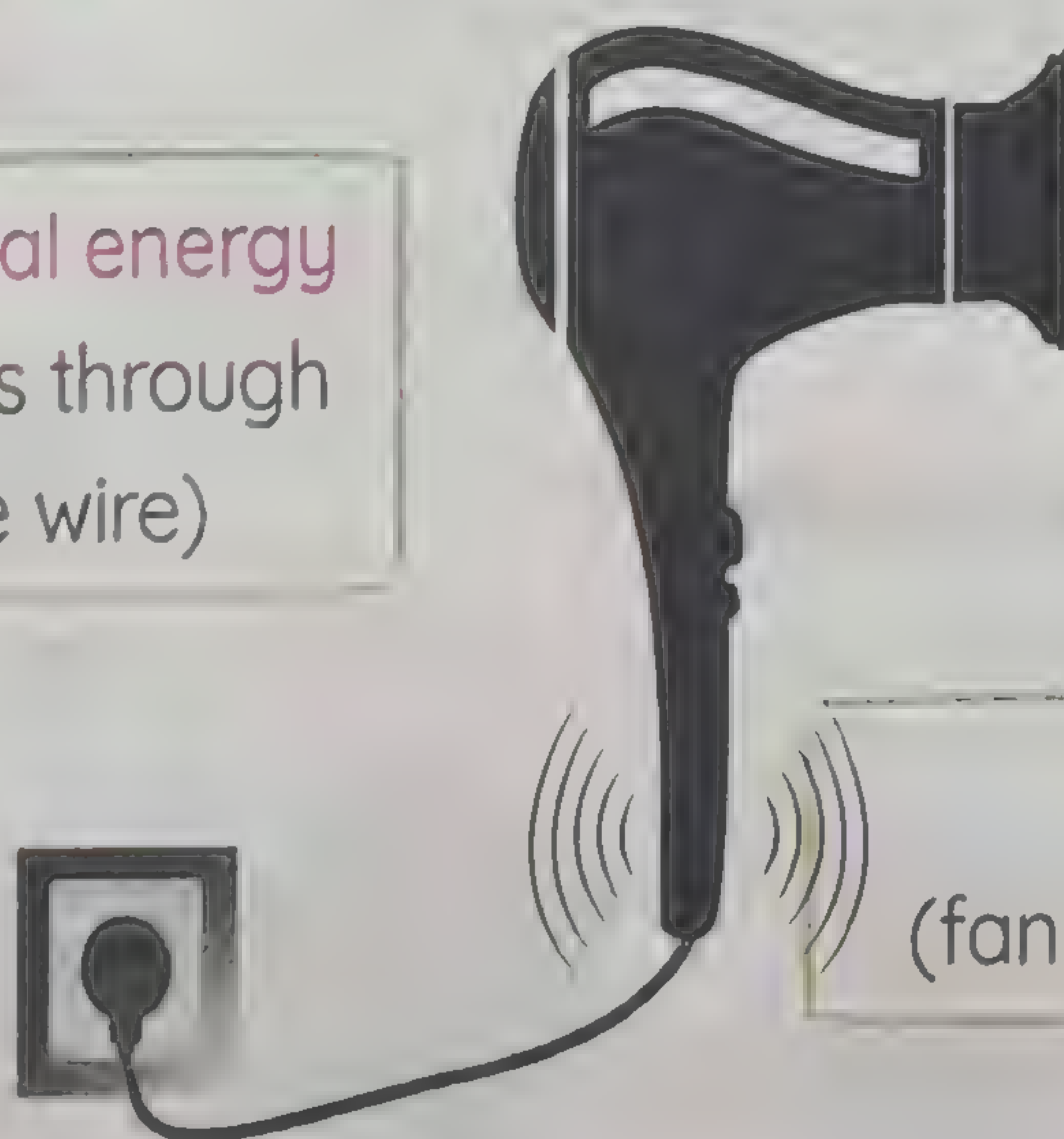
1 Hair Dryer

Function: **Drying hair**

Input energy



Electrical energy
(moves through
the wire)



Output energies



Thermal energy
(to dry hair)

Sound energy (noise)

Kinetic energy
(fan movement and air flow)

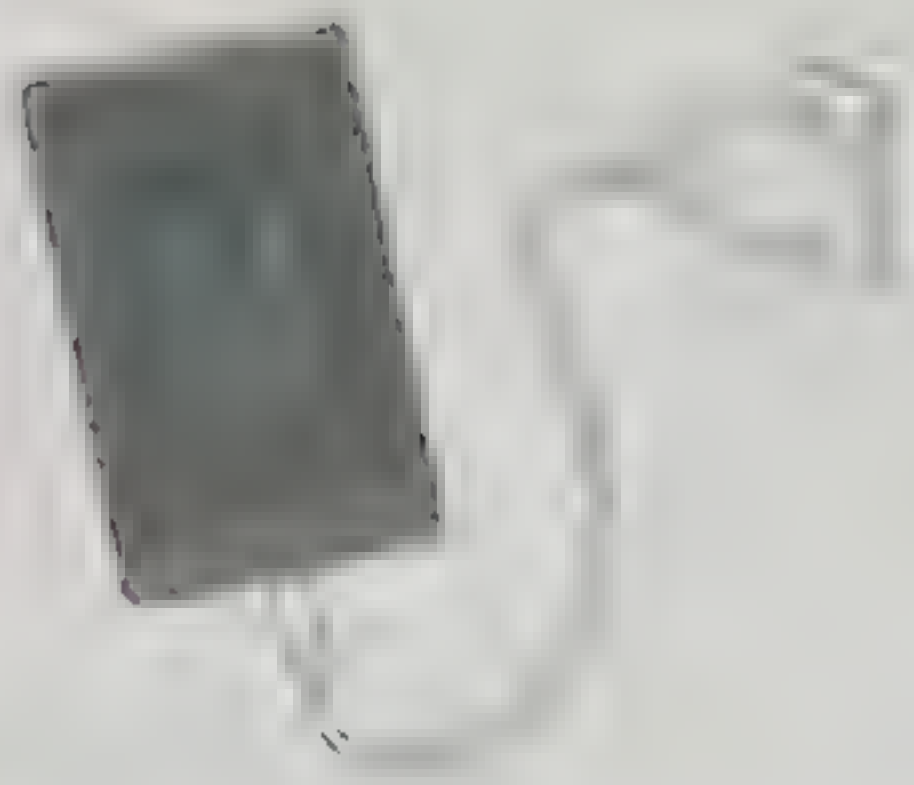


Noise from a hair dryer seems like "lost energy".

Because sound energy doesn't help the hair dryer do its main function.

2 Mobile Phone

Function: **Light up – Ring – Process information**



Input energy



Electrical energy
(when charging the phone.)

electrical energy is stored
in battery in a form of
chemical energy.



Output energy

**Light energy and
sound energy**

GR

When using a mobile phone for a long time,
some energy is lost.

Because thermal energy is produced and it does
not help the mobile phone do its main functions.



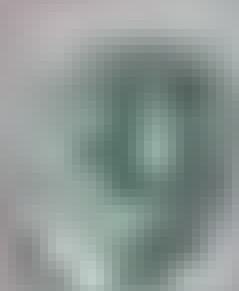
Check your understanding?

Put (✓) or (X):

- 1 Electrical energy is used to operate hair dryer. ()
- 2 Sound energy is produced in both the hair dryer and mobile phone. ()
- 3 Thermal energy helps the mobile phone to do its main job. ()
- 4 Some of the output energies don't perform the device's function. ()



Activity



Build an Energy Chain






Experiment



- In this activity, we will build an energy chain that shows the flow of energy and energy transformations.

• في هذا النشاط، سوف نقوم ببناء سلسلة طاقة تُوضِّح مسارات انتقال الطاقة وتحولات الطاقة.

Tools:

				
Magazines	Scissors	Tape	Construction paper	Marker

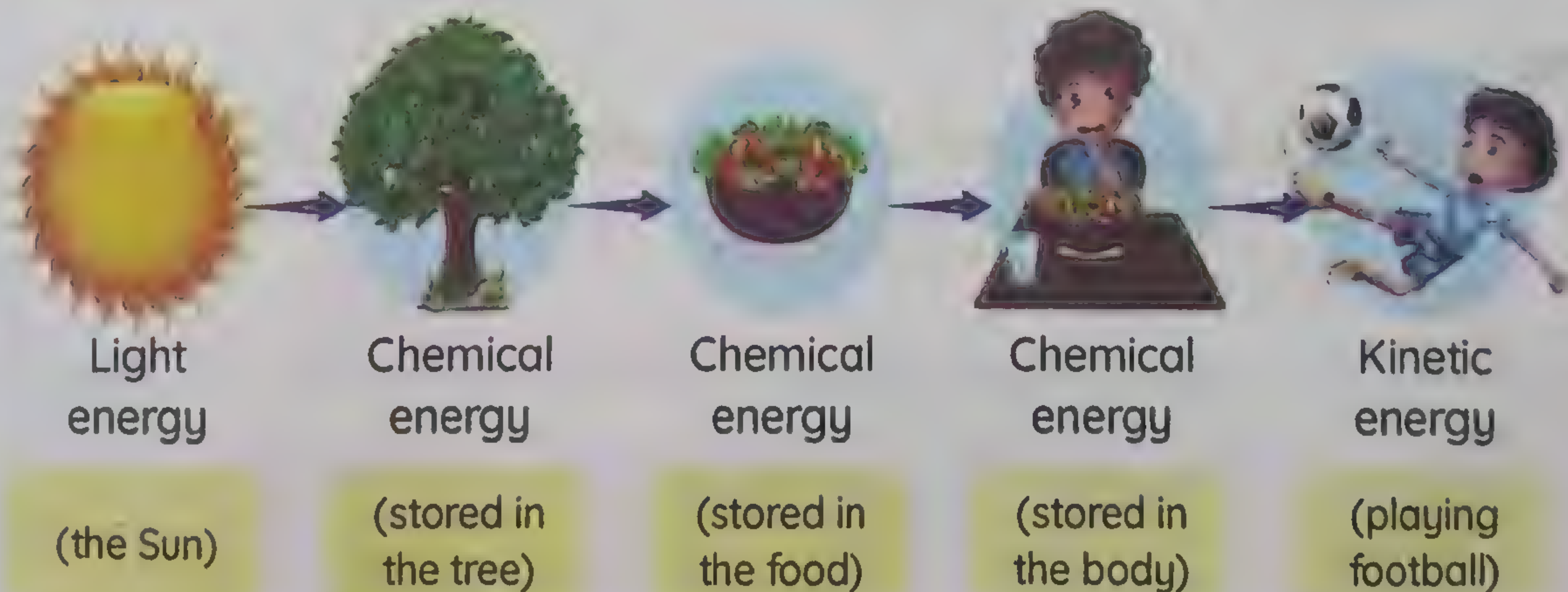
Steps:

- 1 Use the **scissors** to collect pictures from **magazines** that help you build an energy chain.
- 2 Label each picture in a suitable place on the **construction paper** using the **tape**.
- 3 Use the **marker** to illustrate the kind of energy for each picture.

(The energy chain must be at least 5 stages)

Result:

For example: Energy chain during playing football





Activity 10

Record Evidence Like a Scientist
Energy in Remote-Controlled Cars

3

Unit

- » You have learned a lot about energy transformations and how different devices get the energy that they need to operate.

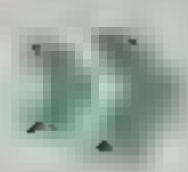


Question:

- » How can you describe the energy in a remote-controlled car now?



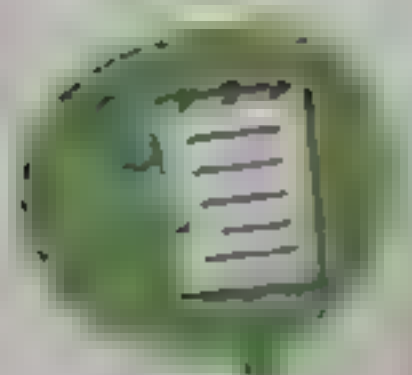
My Claim:





Evidence:





Scientific Explanation with Reasoning:



Exercises on Lesson 4

Choose the correct answer:

- 1 During charging a mobile phone, the _____ energy is stored in battery as _____ energy.
a. chemical - electrical b. electrical - chemical
c. electrical - sound d. chemical - light
- 2 When operating devices for a long time, _____ energy is produced as lost energy that doesn't help the devices to do any function.
a. chemical b. electrical
c. thermal d. sound
- 3 All the following are from the consumed or produced energies in the mobile phone, except the _____.
a. chemical energy b. light energy
c. sound energy d. potential energy
- 4 All the following things store chemical energy, except _____.
a. trees b. the light bulb
c. the human body d. batteries
- 5 Thermal energy is not considered as a lost energy in the _____.
a. mobile phone b. washing machine
c. electric fan d. hair dryer
- 6 _____ energy is the output energy that helps the washing machine do its function.
a. Kinetic b. Sound c. Thermal d. Electrical

Put (✓) or (X):

- 1 The produced sound energy helps the hair dryer do its function. ()
- 2 Energy can be transformed from one form to another. ()
- 3 Sound energy produced by the electric mixer helps it do its function. ()

Energy and fuel

- 4 The amount of energy entering any device equals the sum of the energies produced from it.
- 5 The amount of electric energy used to charge a mobile phone is greater than the produced light energy.
- 6 All the energy that enters the device leaks out in the form of heat.

3 Write the scientific term:

- 1 The lost energy produced from the blender and you can hear it. (.....)
- 2 The lost energy when using the mobile for a long time. (.....)

4 Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 Chemical energy	a. it is lost energy when operating a mobile device for a long time.
2 Light energy	b. it is used to charge the mobile battery.
3 Electrical energy	c. it is stored inside the mobile battery.
4 Thermal energy	d. it is produced from the mobile phone.
1	2
3	4

5 Give reasons for:

- 1 Sound energy produced from the blender is a lost energy.
.....
- 2 Thermal energy produced from the electric heater isn't lost energy.
.....

6 What happens if?

- 1 You operate your mobile device for a long time?
.....

Model Exams

on Concept 3.1

Model Exam 1

Question 1

(A) Choose the correct answer:

- The produced _____ energy doesn't help the blender do its job.
a. sound b. kinetic c. chemical d. potential
- Curiosity Rover is designed to explore _____.
a. the Sun b. the moon c. Mars d. Earth
- Electric wires are made of _____ material.
a. plastic b. wood c. Iron d. copper
- All the following devices produce thermal energy, except the _____.
a. hair dryer b. watch c. kettle d. electric heater

(B) Write the scientific term:

The energy produced when the wood of trees is burned. (_____)

Question 2

(A) Put (✓) or (X):

- Operating remotely means being controlled from a distance. ()
- Energy can't be transformed from one form to another. ()
- The amount of electric energy used to charge a mobile phone is greater than the amount of light energy produced. ()
- When you rub your hands, kinetic energy changes to heat energy. ()

(B) Cross out the odd word: Food - Battery - Lamp - Coal (_____)

Question 3

(A) Choose from column (A) what suits it in column (B):

(A)	(B)
1 Chemical energy	a. it is lost energy when operating a mobile device for a long time.
2 Light energy	b. it is used to charge the mobile battery.
3 Electrical energy	c. it is stored inside the mobile battery.
4 Thermal energy	d. it is produced by the mobile phone.

(B) Give a reason for:

Noise from a hair dryer seems to be "lost energy".

Model Exam 2

Question 1

(A) Choose the correct answer:

- 1 Batteries store _____ energy inside them.
a. chemical b. electrical c. solar d. kinetic
- 2 During riding a bike, some kinetic energy is converted into energy due to the friction of the bike's tire with the road.
a. chemical b. potential c. thermal d. electrical
- 3 The _____ uses the thermal energy to do its function.
a. mobile phone b. washing machine c. TV d. hair dryer
- 4 Some energy is lost in most devices in the form of _____ energy.
a. electrical b. thermal c. sound d. kinetic

(B) Write the scientific term:

The lost energy when using a computer. (_____)

Question 2

(A) Put (✓) or (X):

- 1 Mars is located a few kilometers away from Earth. (_____)
- 2 The energy chain of a burning candle is composed of chemical energy converted into thermal energy and light energy. (_____)
- 3 There's no lost energy when you turn on washing machine. (_____)
- 4 The produced sound energy helps the blender do its function. (_____)

(B) Cross out the odd word:

Hairdryer - Blender - Washing machine - Light bulb. (_____)

Question 3

(A) Complete the following table:

Device	Input Energy	Output Energy
1 Blender	_____	_____
2 Kettle	_____	_____
3 Hand bell	_____	_____

(B) What happens if?

You turn on an electric fan? (According to energy changes).



Concept 2

About Fuel

Concept Objectives:

By the end of this concept:

- Students can describe patterns in how different types of fossil fuel are formed and predict the properties and uses of different types of fossil fuel.
- Students can describe how the use of energy and fuel affects the environment.

Key Vocabulary:

- Energy efficiency
- Fossil fuel
- Fuel
- Generate energy
- Pollution
- Renewable energy resources
- Nonrenewable energy resources

Concept

2

About Fuel

Lesson 1

Activity 1 Can You Explain?

Activity 2 Fuel and Road Trips

Activity 3 What Do You Already Know About Fuel?

Lesson 2

Activity 4 Types of Fuel

Activity 5 Oil and Water

Lesson 3

Activity 6 Fossil Fuel Formation

Activity 7 Living Without Electricity

Activity 8 Using Fossil Fuel to Generate Electricity

Lesson 4

Activity 9 Big City Environmental Concerns

Activity 10 Burning Fossil Fuel and Pollution

Activity 11 Conserving Fossil Fuel

Lesson 5

Activity 12 Using Fuel

Activity 13 Record Evidence Like a Scientist

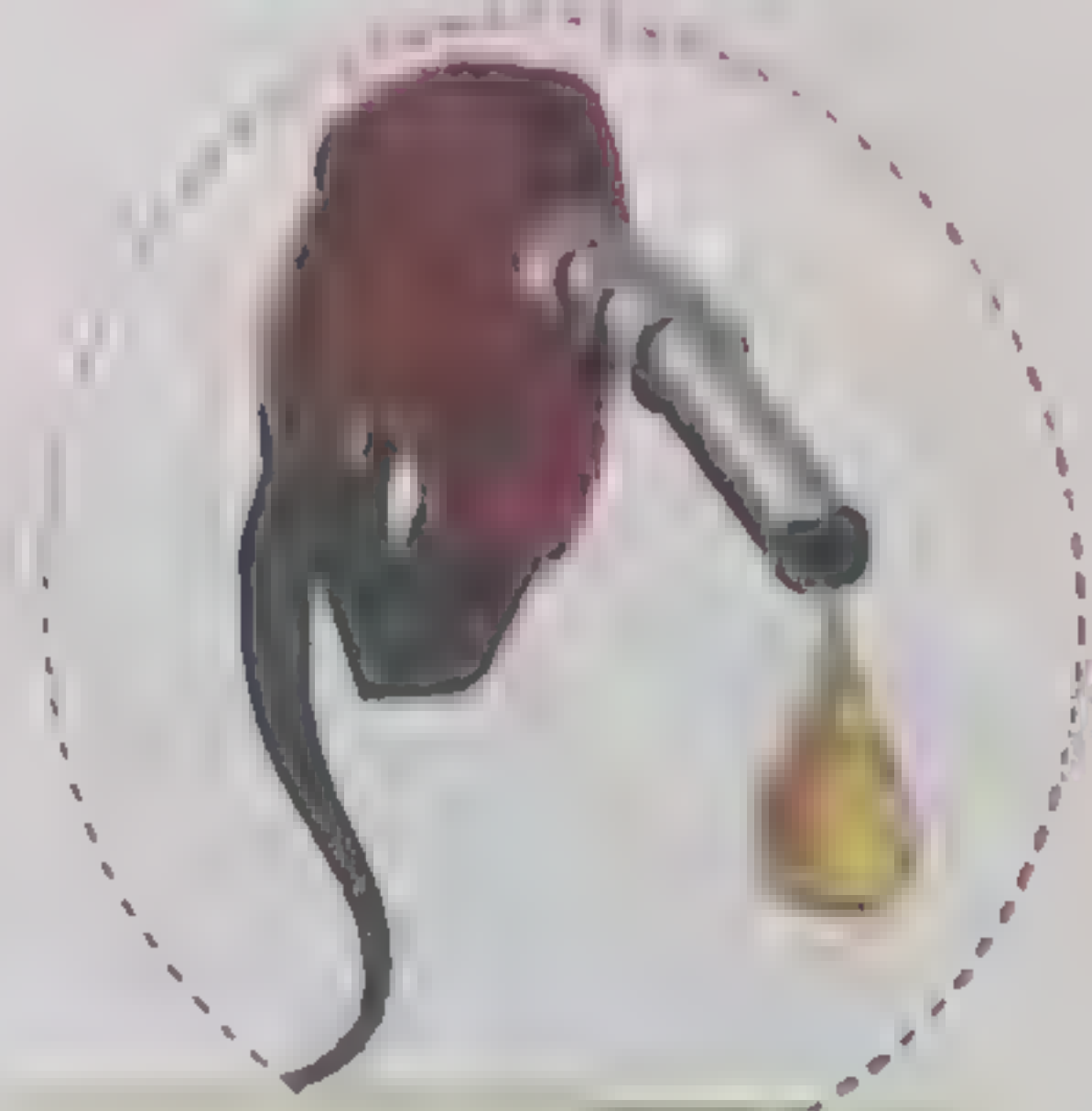


Activity

1 Can You Explain?

Humans use many forms of **fuel** in their daily lives, such as:

Gasoline



used in
moving cars.

Natural gas



used in
cooking.

Coal



used in
warming.

Fuel: A substance that produces thermal energy when it is burned.



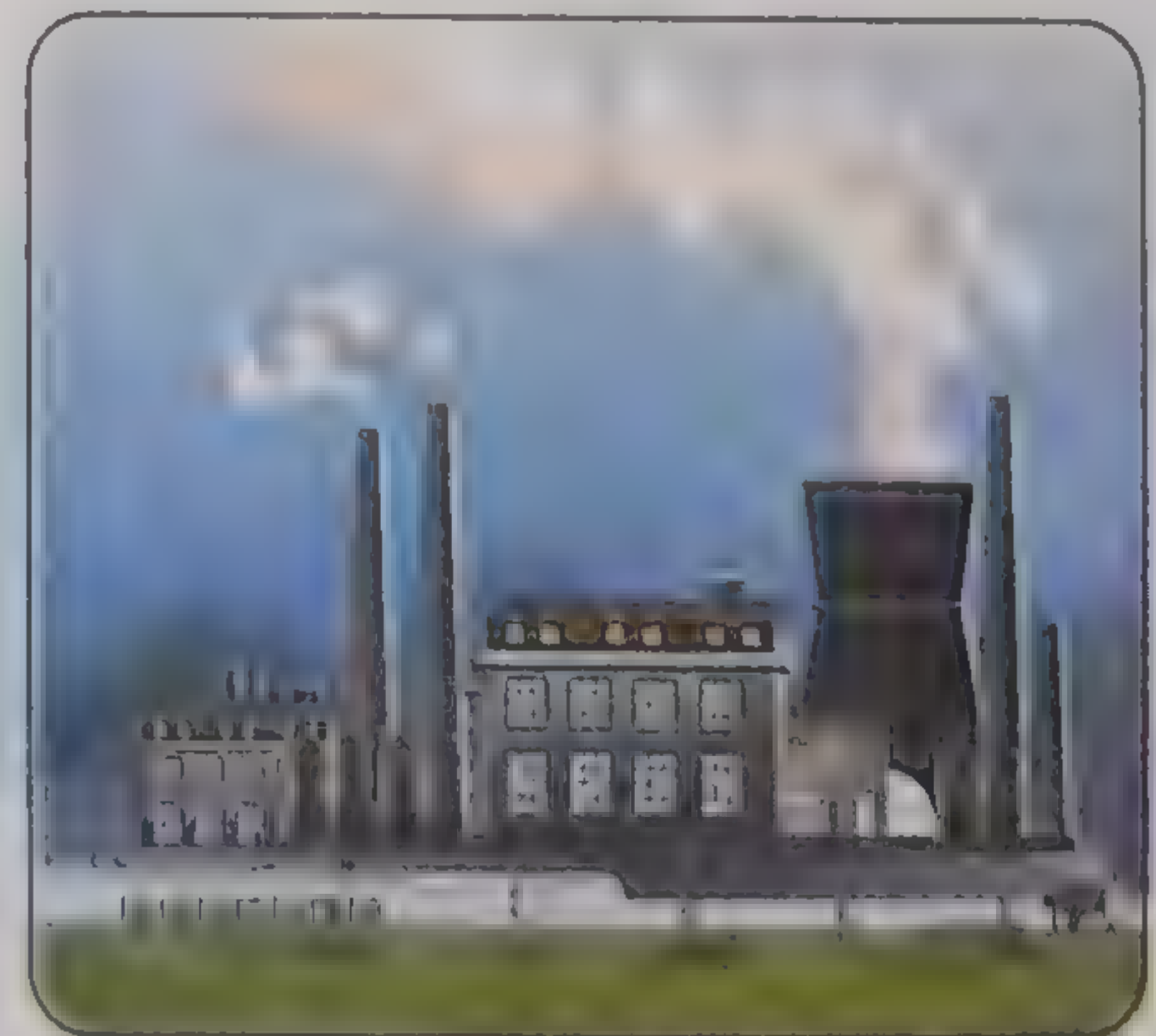
- Gasoline is made up of oil.
- Oil, coal, and **natural gas** are extracted from the **underground**.

• البنزين هو وقود مشتق من النفط.

• يُستخرج النفط والفحم والغاز الطبيعي من باطن الأرض.

- Fuel is burned in electric power stations to generate electricity.

• يحترق الوقود في محطات الطاقة لتوليد الكهرباء.





Activity 2

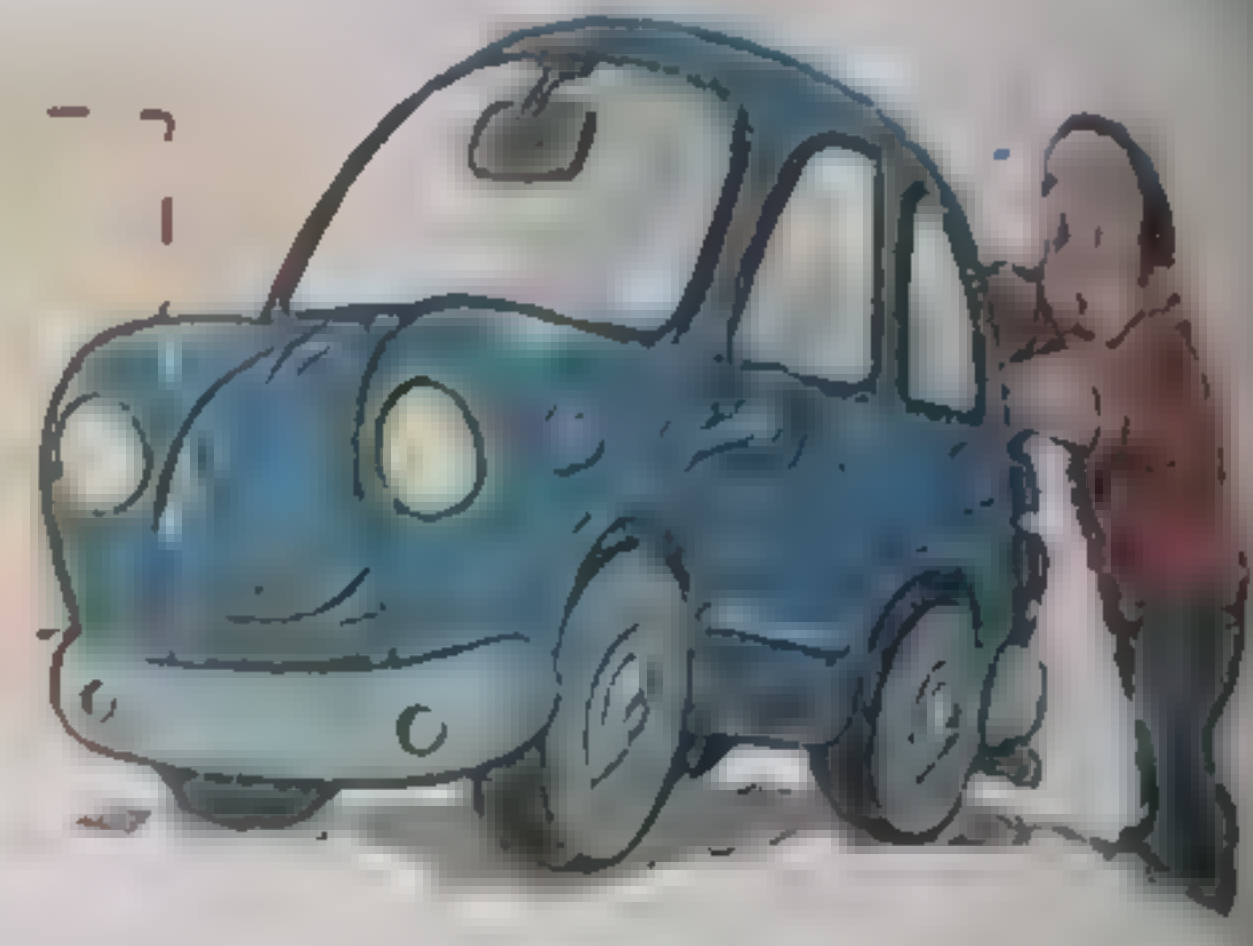
Fuel and Road Trips

Unit 3

Choose the correct answer:

- 1) Cars need to move.
- 2) As the speed of the car increases, the amount of used fuel
(food)
(decreases - increases)

If the fuel runs out, the car will stop moving.

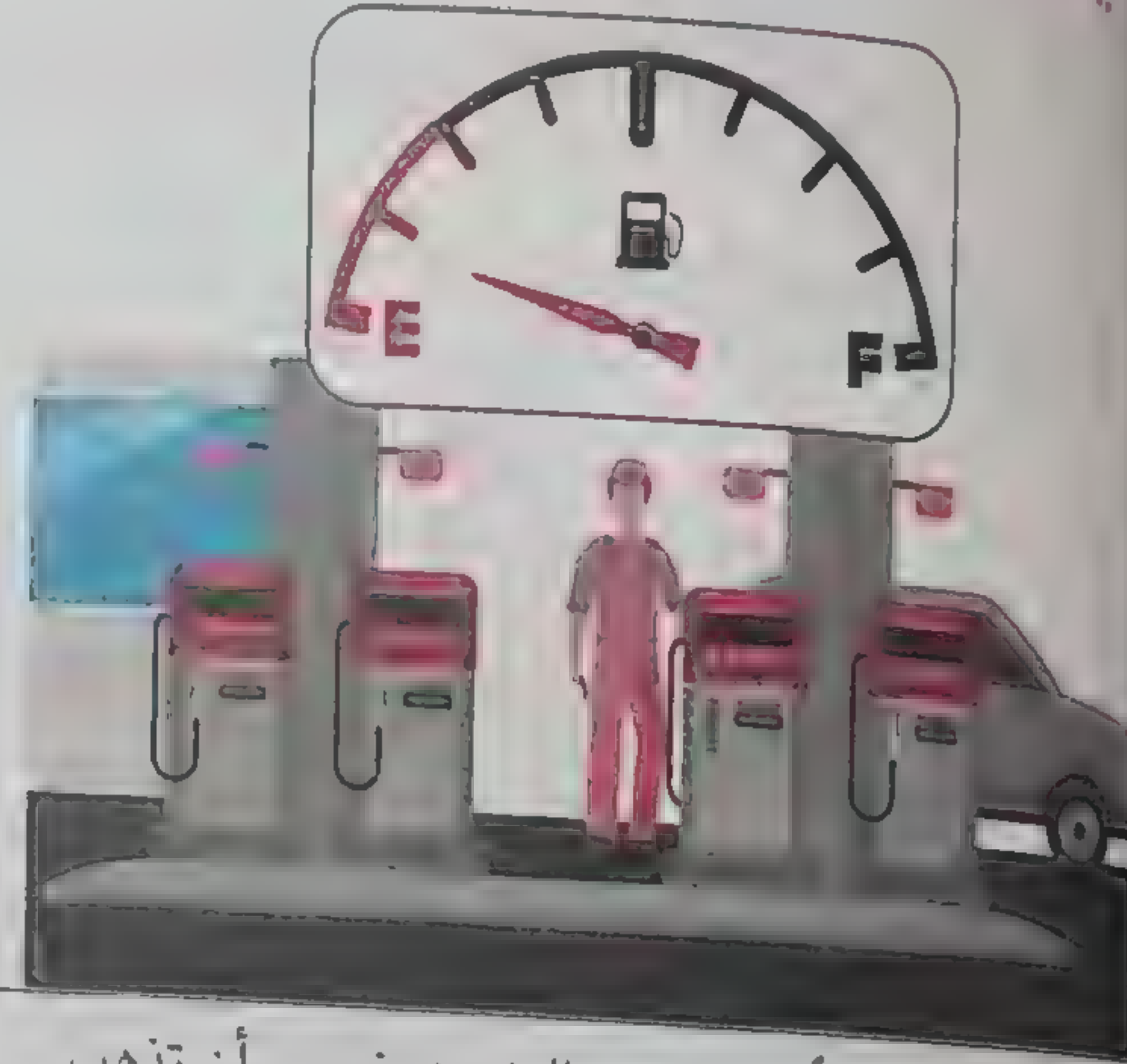


When going on long trips in the car, we must check the gasoline pointer.



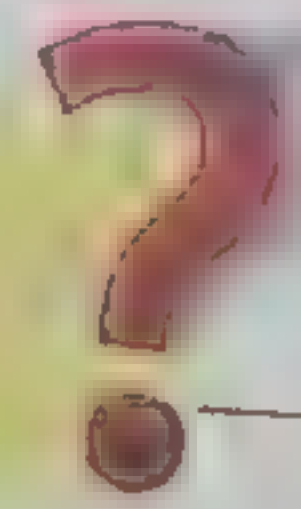
• عند الذهاب في رحلات طويلة باستخدام السيارة، يجب أن نتحقق من مؤشر الوقود.

If you notice a drop in the gasoline pointer, you should go to the nearest gas station.



إذا لاحظت انخفاضاً في مؤشر البنزين، فيجب أن تذهب إلى أقرب محطة وقود.

How is a car operated?



- 1) Gasoline burns inside the car's engine.
(Thermal energy)
- 2) The car's engine rotates the wheels of the car.
(Kinetic energy)



يحترق الوقود في محرك السيارة، فيتمكّن المحرك من تدوير عجلات السيارة.



Activity



What Do You Already Know About Fuel?

- We use fuel in many different ways every day.
- Fuel stores **chemical energy** inside it.
- Fuel is used as a source of **thermal energy** when it is burned.

Uses of Some Types of Fuel



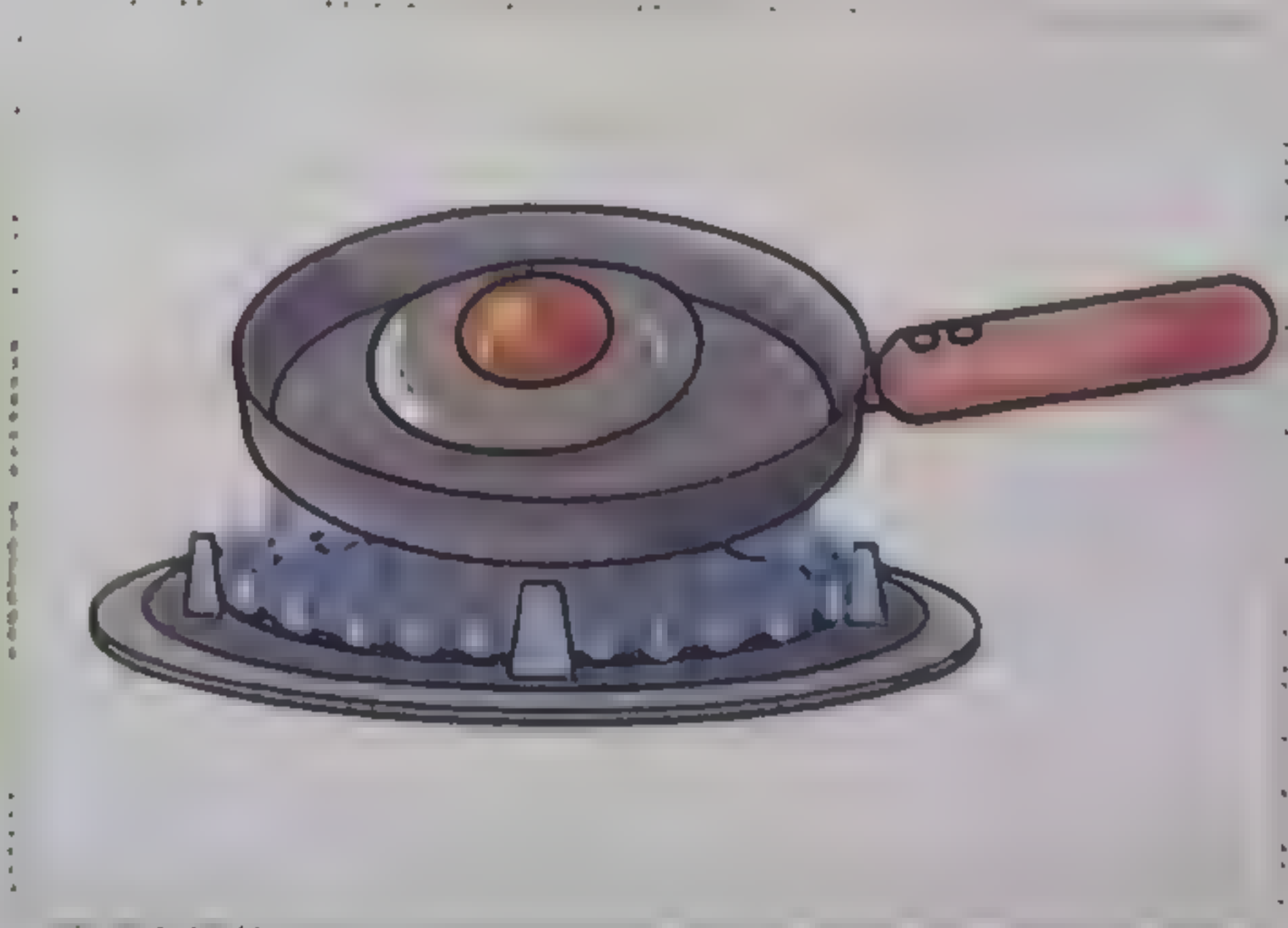
Gasoline or natural gas are used in operating all means of transportation.

Oil, natural gas, or coal are used in generating electricity.



Coal or wood are used in warming houses.

Coal, natural gas, or wood are used in cooking food.



Exercises on Lesson 1

1 Choose the correct answer:

- 1 All the following are found deeply under the Earth's surface, except
 a. coal b. oil c. natural gas d. green plants
- 2 _____ is considered as the main source of energy on the Earth.
 a. A plant b. The Sun c. The moon d. Fuel
- 3 Cars need _____ to move on the road.
 a. batteries b. water c. coal d. gasoline
- 4 As fuel burns inside the _____, the wheels of the car rotate.
 a. tires b. battery c. engine d. airbag
- 5 _____ energy is stored inside coal.
 a. Thermal b. Solar c. Chemical d. Electrical
- 6 If we are going on a long trip in the car, we must check the _____.
 a. seats b. engine
 c. speedometer d. gasoline pointer
- 7 Coal is used in all the following purposes, except _____.
 a. warming houses b. watching the TV
 c. cooking food d. boiling water
- 8 _____ is /are used in operating all means of transportation.
 a. Gasoline b. Coal c. Natural gas d. a and c
- 9 Fuel is used as a source of _____ energy.
 a. thermal b. chemical c. light d. solar
- 10 You can burn _____ to feel warm in your home in winter.
 a. gasoline b. coal c. wood d. b and c

Put (✓) or (X):

- 1 Oil, coal, and natural gas are extracted from underground. ()
- 2 As the speed of the car increases, the amount of used fuel decreases. ()
- 3 Short trips consume more fuel than long trips. ()
- 4 We cannot drive a car if the gasoline inside the fuel tank runs out. ()
- 5 When the gasoline pointer is close to zero, it means you need to recharge the car batteries quickly. ()
- 6 Coal can be used to move our cars if they stop suddenly. ()
- 7 Thermal energy is produced by burning a piece of wood. ()
- 8 Water could be used to warm our houses on cold winter days. ()
- 9 Cars, buses, and bicycles need gasoline to run on roads. ()

Write the scientific term:

- 1 The main source of most forms of energy on Earth. (_____)
- 2 A device that helps the car driver check the amount of fuel. (_____)
- 3 A liquid fossil fuel that burns inside the car engine. (_____)
- 4 The kind of energy that is stored in fuel. (_____)
- 5 A form of energy produced by burning fuel. (_____)

Complete the following using the words between the brackets:

(Oil - coal - gasoline pointer - electricity - wood - underground - Fossil fuel)

- 1 _____, such as coal and natural gas are found _____.
- 2 When the _____ is near to zero, you must go fast to the nearest gas station.
- 3 Some forms of fuel, such as _____ and _____ can be used in warming.
- 4 _____, natural gas, and coal are used in electric power stations to generate electricity.

5 Choose from column (A) what suits it in column (B):

A

Column (A)

Column (B)

1 Gasoline pointer	a. gasoline burns inside it.
2 In a car engine,	b. makes the car move and stop.
3 Car wheels	c. helps us check fuel in the car.

1 _____ 2 _____ 3 _____

B

Column (A)

Column (B)

1 Chemical energy	a. it is generated in power plants.
2 Kinetic energy	b. it is stored inside fuel.
3 Thermal energy	c. it is produced when the car wheels rotate.
4 Electrical energy	d. it is produced when burning a piece of coal.

1 _____ 2 _____ 3 _____ 4 _____

C

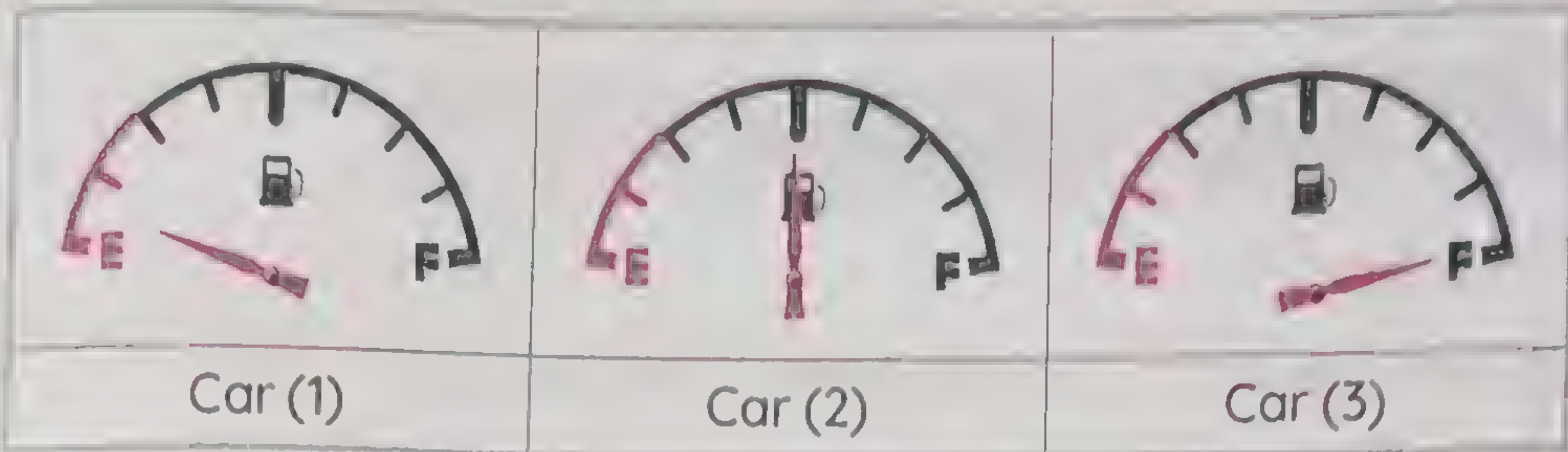
Column (A)
Usage

Column (B)
Fuel

1 Warming houses	a. Coal, natural gas, or wood
2 Operating cars	b. Coal or wood
3 Generating electricity	c. Oil, natural gas, or coal
4 Cooking food	d. Gasoline or natural gas

1 _____ 2 _____ 3 _____ 4 _____

Study the following figures, then complete the following questions:



- 1 This device is called _____ and it helps the driver check the _____.
- 2 The driver in car (_____) needs to go quickly to the nearest gas station.
- 3 The fuel tank is full with gasoline in car (_____).
- 4 Half the amount of gasoline is remaining in car (_____).

Give reasons for:

- 1 Gasoline is very important for cars to move.

- 2 The fuel (gasoline) pointer is very useful for drivers.

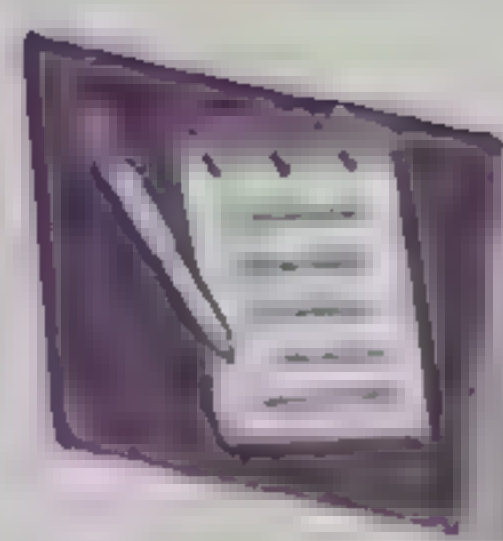
What happens if?

- 1 We burn a piece of coal?

- 2 The fuel pointer in the car becomes zero?

- 3 Gasoline is burned inside the car's engine?

Lesson 2

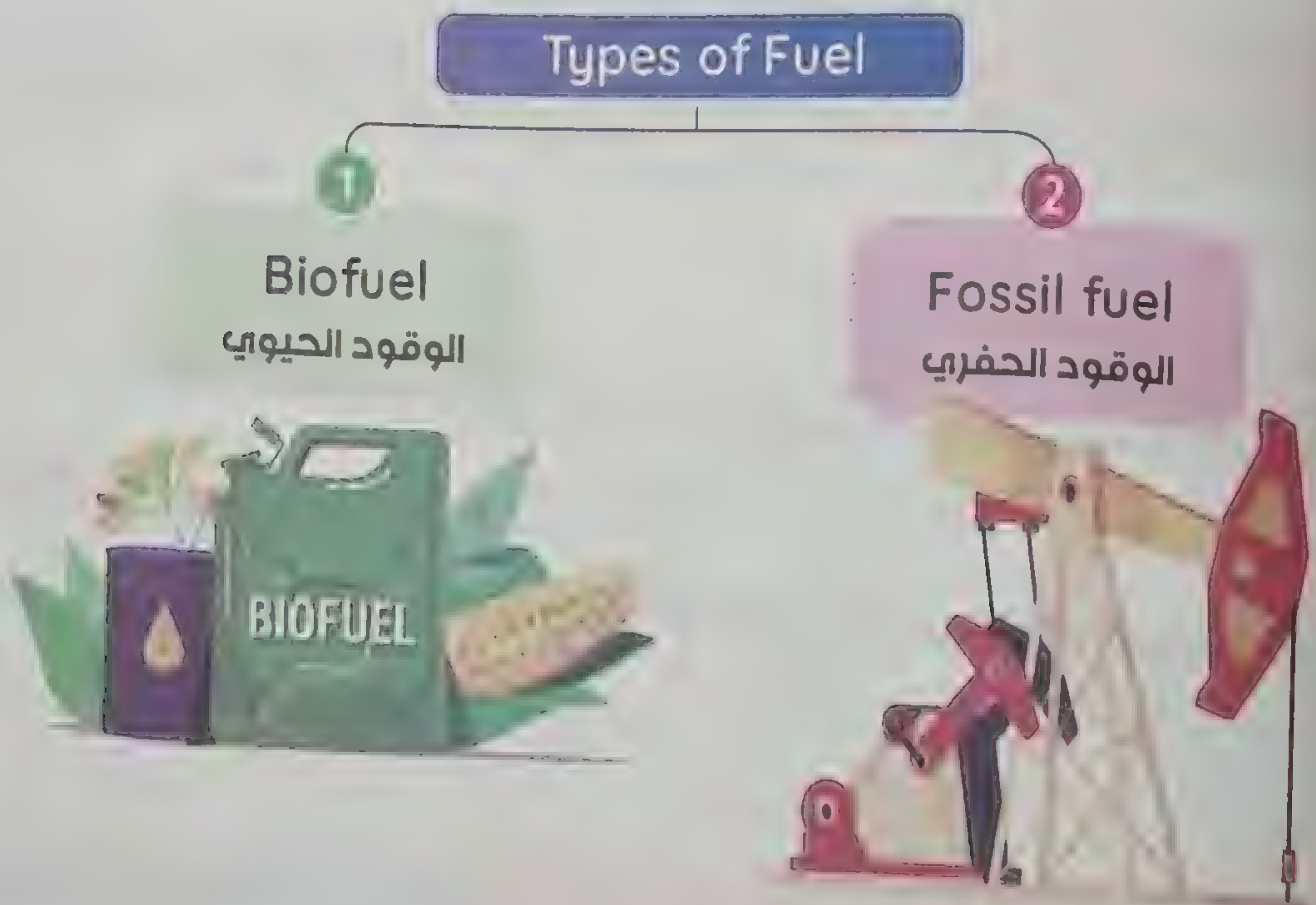


Activity 4 Types of Fuel

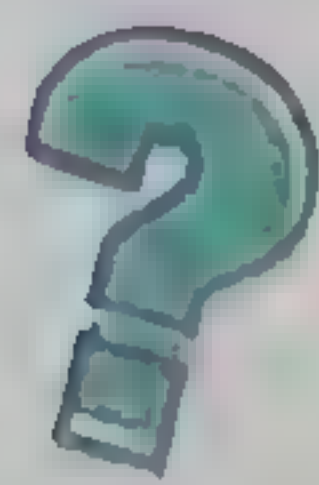
» Put (✓) or (X):

- 1 Gasoline is a liquid that is used as fuel for cars.
- 2 Both coal and wood are used in warming.

Fuel: It is a material that releases thermal energy when burned.
وقود: هو مادة تُنتج طاقة حرارية عند حرقها.



Give reasons for...



- 1 Biofuel is considered a renewable source of energy.

Because it is renewed by the continuous growth of plants.

- 2 Fossil fuel is considered a nonrenewable source of energy.

Because they are gone and cannot be easily renewed.

1 Biofuel: (Renewable resource of energy)

It is the fuel that is made from living things that can be planted.

الوقود المتجدد: هو الوقود الذي يُنتج من الكائنات الحية التي يمكن زراعتها.

Examples:

Wood



Grass



Corn



- Wood is the most ancient fuel; it is still used all around the world.
- Charcoal is made from wood.
- Liquid fuel is made from grass, corn, and wood chips.

يُعتبر الخشب من أقدم أنواع الوقود، وما زال يُستخدم في جميع أنحاء العالم. • يُصنع الفحم النباتي من الخشب. • يمكن تحويل العشب والذرة ورقائق الخشب إلى وقود حيوي سائل.

Biofuel Conservation



- Using wood as fuel requires cutting down trees.
- Cutting down trees at a faster rate leads to deforestation.
- Deforestation has a negative impact on our environment.

استخدام الخشب كوقود يتطلب قطع الأشجار. • قطع الأشجار بوتيرة سريعة يؤدي إلى إزالة الغابات. • إزالة الغابات لها تأثير سلبي على بيئتنا المحيطة بنا.

NOTE:

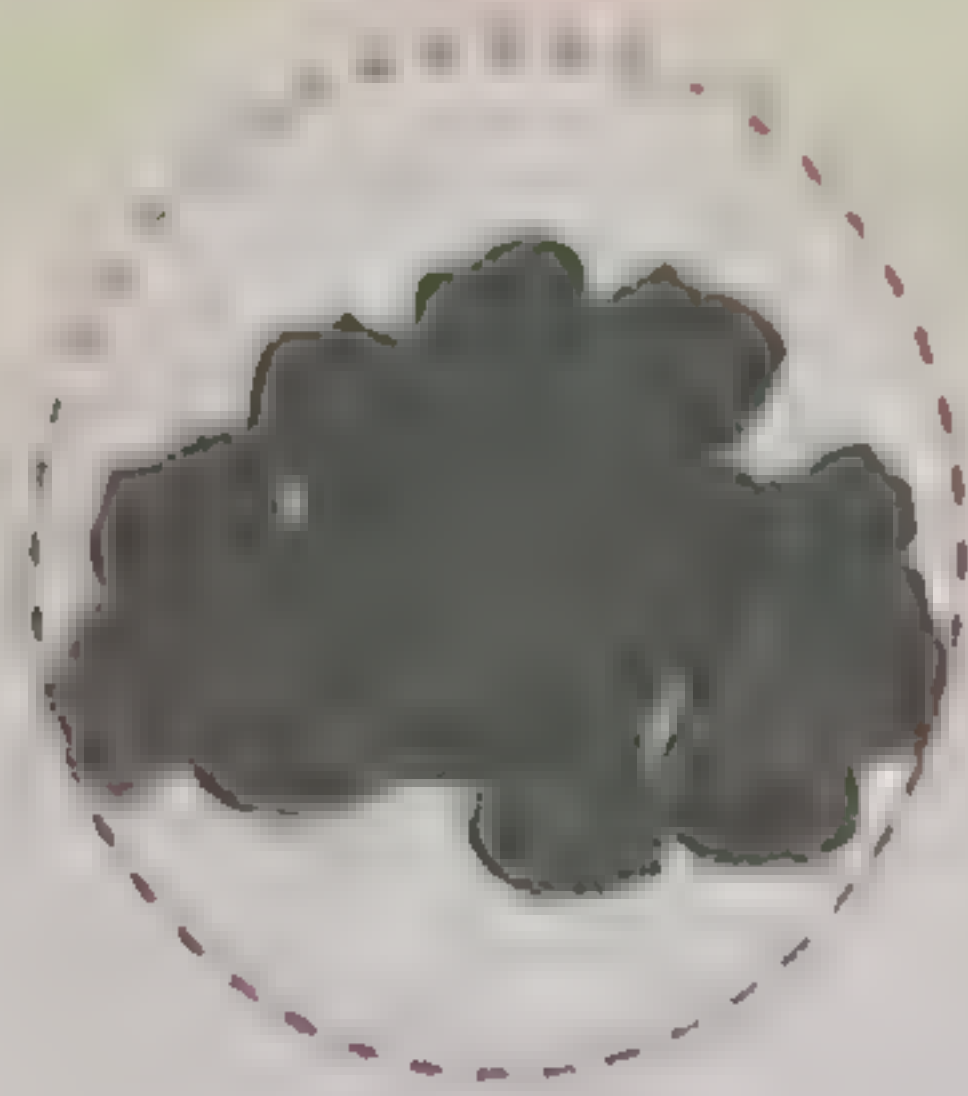
- Some trees grow a few centimeters every year and reach their full height in more than one person's lifetime.
- هناك أشجار تنمو سنتيمترات قليلة كل عام، ويستغرق اكتمال نموها مدة أطول من عُمر الإنسان.

2 Fossil fuel: (Nonrenewable resource of energy)

- It is the fuel that was formed from the remains of plants and animals that were buried and decomposed over millions of years ago.

Examples:

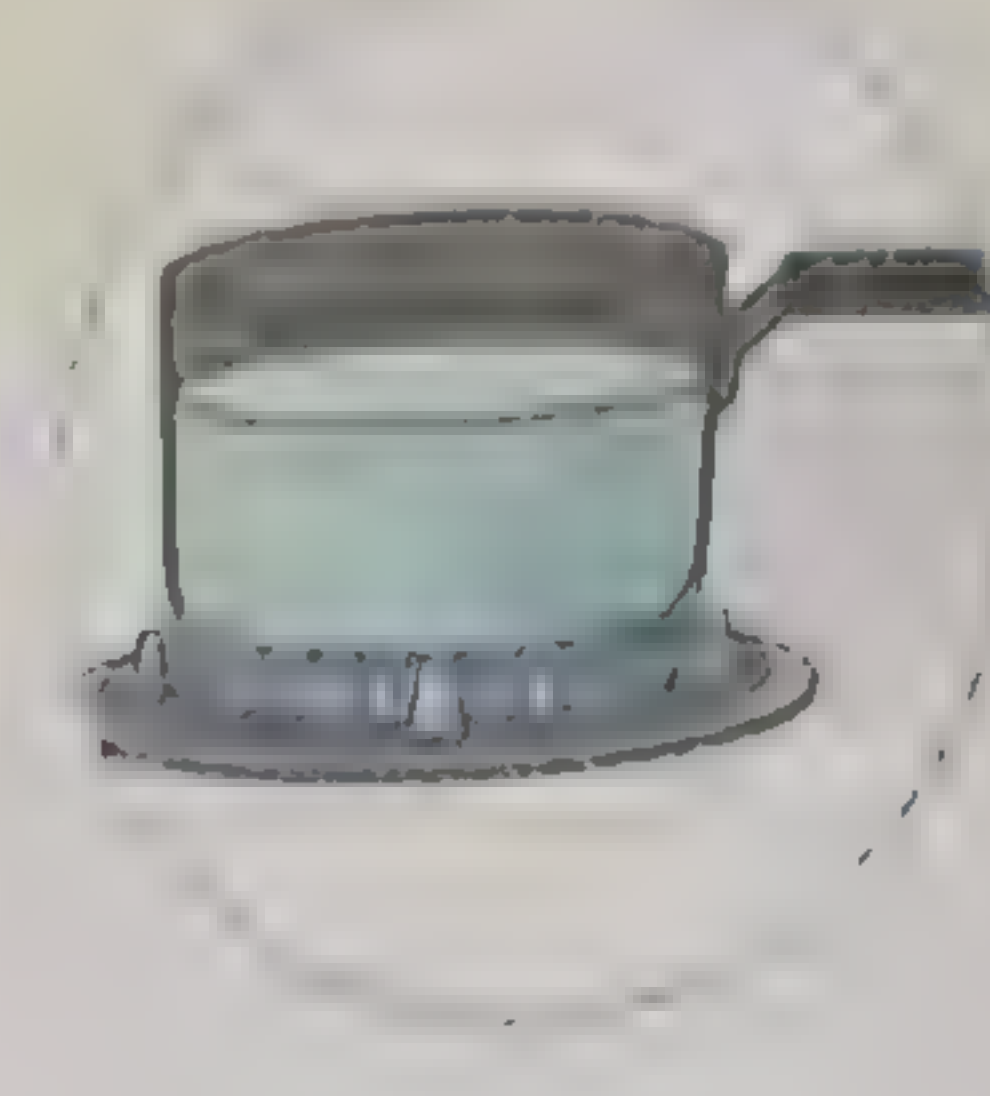
Coal



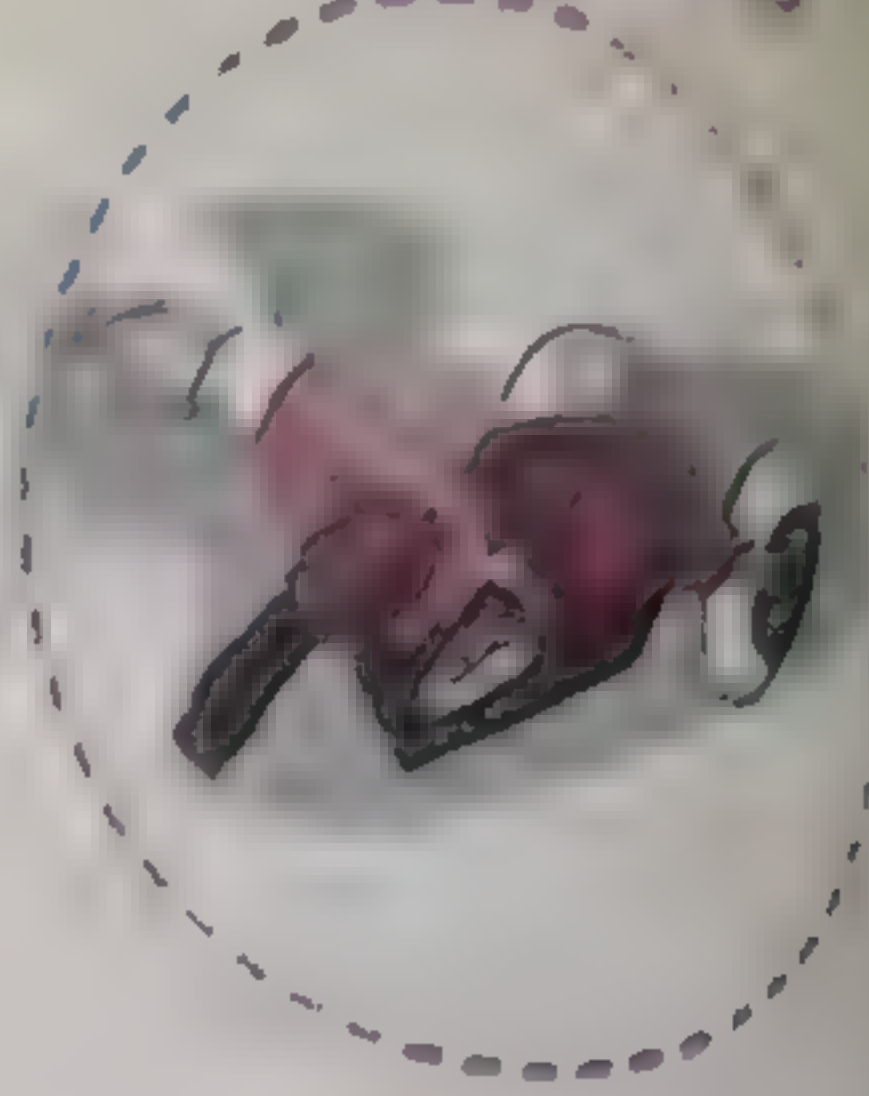
Oil



Natural gas



Gasoline



- » Coal is formed from the decomposition of ancient plants remains.
- » Oil and natural gas are formed by the decomposition of the remains of ancient sea animals.
- » Gasoline is a fuel that is formed from oil.

تكوّن الفحم من تحلل بقايا النباتات الجافة القديمة.
تكوّن النفط والغاز الطبيعي من تحلل بقايا الكائنات البحرية القديمة.
البنزين هو وقود مشتق من النفط.

- Fossil fuel are extracted from underground.
- Fossil fuel are formed very slowly over millions of years, which means that we use them faster than they are formed.



الوقود الحفري يُستخرج من باطن الأرض.
تشكل الوقود الحفري ببطء شديد على مدى ملايين السنين، وهذا يعني أننا نستخدمه بشكل أسرع من معدل تكوّنه.

Formation of Coal

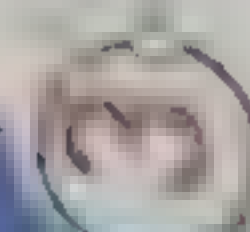
- Over millions of years ago, large areas of Earth were covered with plants and swamps.
- When these plants died, their remains were covered with hundreds of meters of mud and rocks under the Earth's surface.
- Earth's heat and pressure turned these remains into coal.

- منذ ملايين السنين، كانت مساحات كبيرة من الأرض مغطاة بالأشجار والمستنقعات.
- عندما ماتت تلك النباتات، غطتها مئات الأمتار من الطين والصخور تحت سطح الأرض.
- بفعل الحرارة والضغط تحولت بقايا النباتات الجافة إلى فحم.

Important Comparisons

P.O.C	Fossil Fuel	Biofuel
Definition	It is the fuel that was formed from the decomposition of plants and animals remains that lived millions of years ago.	It is the fuel that is made from living things that can be planted.
Examples	<ol style="list-style-type: none"> Coal Oil Natural gas Gasoline 	<ol style="list-style-type: none"> Wood Grass Corn Charcoal Liquid fuel
Primary Source	The Sun	
Renewable or Nonrenewable	Nonrenewable resource	Renewable resource

Activity 5 Oil and Water



- » Oil and water are two types of resources that humans can use.
- » There are some similarities and differences between oil and water.

Unit

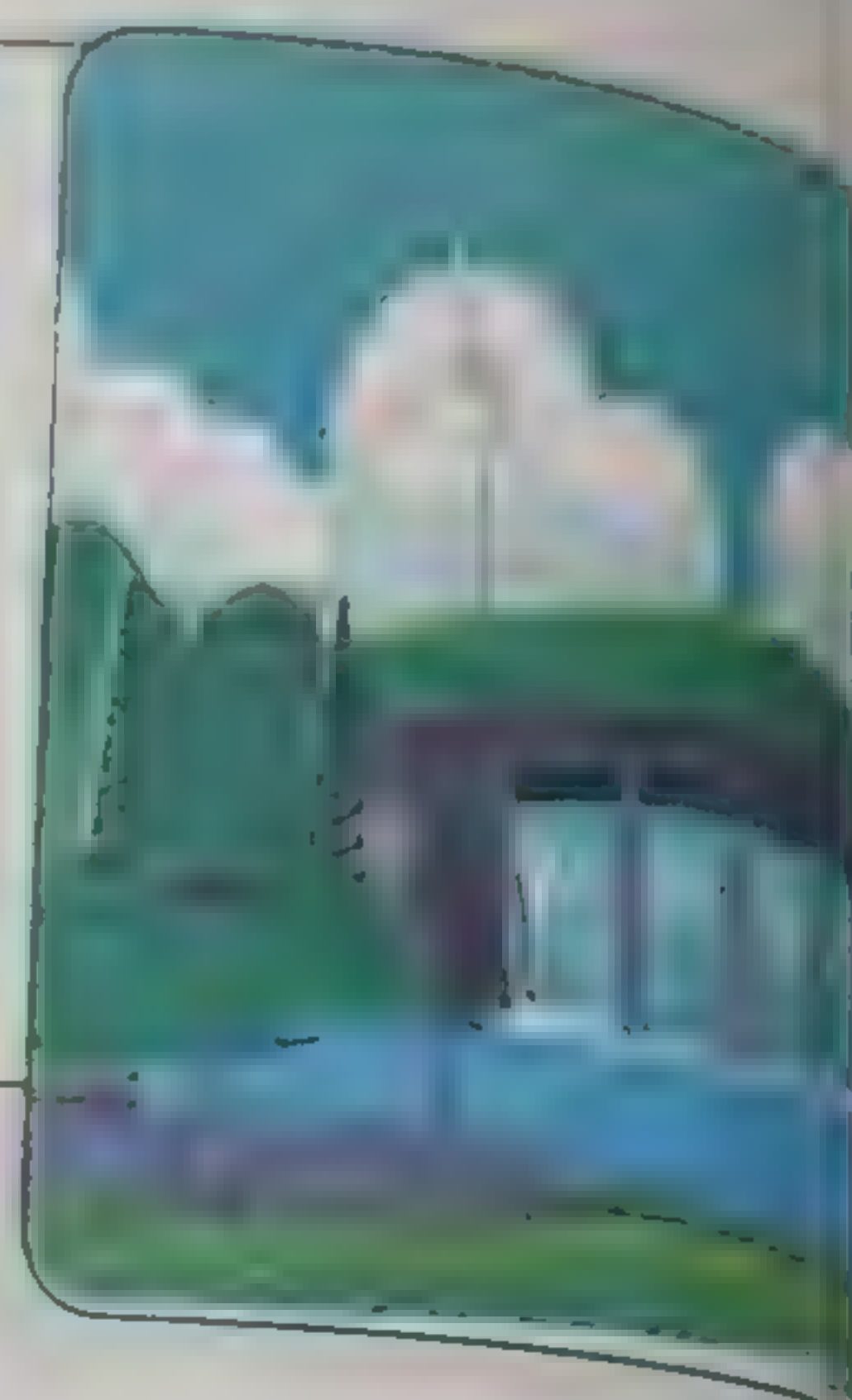
Oil and Water

1 Similarities



- Both oil and water can be used to generate electricity.

يمكننا استخدام النفط والماء لتوليد الطاقة الكهربائية.



2 Differences

- Oil is a nonrenewable resource, while water is a renewable resource.

النفط مورد غير متجدد، بينما الماء مورد متجدد.

Nonrenewable resources

- They are natural resources that are used faster than they can be replaced.

المصادر الغير المتجددة: هي مصادر طبيعية تُستهلك بمعدل أسرع من معدل تجددتها.

Renewable resources

- They are natural resources that can be replaced soon after they are used.

المصادر المتجددة: هي مصادر طبيعية تتجدد بعد وقت قصير من الاستخدام.

1 Oil: Nonrenewable resource of energy

- » Oil is extracted from underground.
- » Oil is formed from the decomposition of ancient sea creatures.

Formation of Oil



Over many millions of years ago,

- » marine organisms died, their remains settled on the sea floor.



- » Layers of sediments and rocks cover the remains of the marine organisms.



- » Over time, those remains were converted into oil due to extreme heat and pressure.

- منذ ملايين السنين، ماتت الكائنات البحرية واستقرت في قاع المحيط.
- تراكمت طبقات الصخور والرواسب على الكائنات البحرية المدفونة.
- مع مرور الوقت، تحولت تلك البقايا إلى نفط تحت تأثير الضغط والحرارة الهائلين.

2

Water

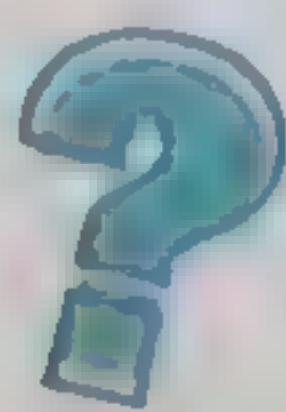
3

Unit

- » Although water is renewable, we must use it carefully and not waste or pollute it.
- » If we waste or pollute water, it may not be replaced as quickly as we need.

رغم من أن المياه مصدر متجدد، إلا أنه يجب علينا استخدام المياه بحرص وعدم إهدارها أو تلويثها.
فإننا بإهدار المياه أو تلويثها، فقد لا نستطيع تجديد المياه بالسرعة والمقدار الذي نحتاجه.

Give a reason for...

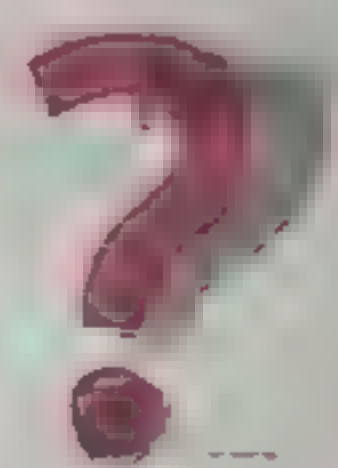


- Water is considered a renewable resource of energy.

Because water is available and hasn't run out yet.



How can we conserve these resources



We can conserve oil by:

- 1 Driving less.
- 2 Using public transportation.



We can conserve water by

- 1 Growing plants that don't require a lot of watering.
- 2 Avoid polluting water.



Exercises on Lesson 2

Choose the correct answer:

- 1 is considered the main source of energy on the Earth's surface.
a. Wind b. Fuel c. The Sun d. Water
- 2 All the following are extracted from underground, except
a. coal b. charcoal c. petroleum d. natural gas
- 3 Ancient people used as a form of fuel before discovering gasoline.
a. wind b. wood c. oil d. coal
- 4 is a renewable resource of energy.
a. Oil b. Coal c. Gasoline d. Corn
- 5 All the following represent renewable resources of energy, except
a. wood b. coal c. charcoal d. grass
- 6 Coal is formed due to the decomposition of ancient dead
a. plants b. animals c. humans d. birds
- 7 is made from wood.
a. Gasoline b. Charcoal c. Grass d. Natural gas
- 8 All the following are used to make liquid fuel, except
a. wood chips b. corn c. charcoal d. grass
- 9 Charcoal is described by
a. being limited b. existing underground
c. being a fossil fuel d. being made from wood
- 10 Natural gas is formed from the decomposition of under extreme pressure and temperature.
a. plants and animals b. sea creatures
c. birds d. trees

11. _____ takes millions of years to be formed.
a. Coal b. Charcoal c. Wood d. Corn

12. One of the disadvantages of overusing biofuel is _____.
a. overfishing b. wildfire c. deforestation d. rain

13. Both water and oil _____.
a. are renewable resources b. are nonrenewable resources
c. have the same structure d. can be used to generate electricity

2 Put (✓) or (X):

1. The Sun is the primary source of forming both biofuel and fossil fuel. ()

2. Coal is the oldest fuel that has been used all over the world by ancient people. ()

3. Biofuel is one of the nonrenewable sources of energy. ()

4. Fossil fuel is made from living things that can be planted. ()

5. All types of fuel are extracted from underground. ()

6. The consumption rate of coal is slower than its formation rate. ()

7. Burning fossil fuel causes deforestation and pollution. ()

8. The amount of oil, water, and air on Earth is limited. ()

9. We can conserve oil by using public transportation. ()

10. Water may not be replaced as quickly as we need. ()

11. We should plant crops that need a large amount of water to conserve water. ()

12. Some plants are used to make liquid biofuel. ()

3 Write the scientific term:

1. The main source of energy for most forms of energies on Earth. ()

2. A material that releases thermal energy on burning. ()

3. It is a natural resource that is used faster than it can be replaced. ()

- 1 It is a natural resource that can be replaced soon after it is used.
(.....)
- 2 It is the fuel that is made from living organisms that can be planted.
(.....)
- 3 It is the fuel that is extracted from deep ground under the Earth's surface.
(.....)
- 4 A kind of fossil fuel that is produced from the decomposition of dead marine organisms.
(.....)
- 5 A fossil fuel that is produced from the decomposition of dead plants.
(.....)
- 6 A kind of biofuel that is made from wood of trees.
(.....)
- 7 A kind of biofuel that is made from corn and grass.
(.....)
- 8 A phenomenon that happens by cutting trees at a faster rate to get biofuel.
(.....)

Complete the following using the words between the brackets:

A (wood - deforestation - underground - oil)

- 1 Ancient people used in cooking food and warming.
- 2 Gasoline is made from, while coal is extracted from
- 3 Cutting trees with a fast rate causes

B (coal - heat - increased - Oil - nonrenewable - decreased - renewable - pressure)

- 1 Extreme and are the factors needed for the formation of fossil fuel underground.
- 2 is formed from the decomposition of a shark's remains, while is formed from the decomposition of trees' remains.
- 3 Water is considered a/an resource of energy, where oil is a/an resource of energy.
- 4 The rate of consumption of fossil fuel must be

5

Choose from column (A) what suits it in column (B):

A

Column (B)

Column (A)	Column (B)
1 The Sun	a. takes a very long time to be formed.
2 Fossil fuel	b. takes a short time to be formed.
3 Biofuel	c. is the primary source of all kinds of energy.

1 2 3

B

Column (A)

Column (B)

1 Liquid fuel	a. was used by ancient people.
2 Gasoline	b. is made from grass, corn, and wood chips.
3 Charcoal	c. is a fuel that is made from oil.
4 Wood	d. is made from wood.

1 2 3 4

6

Classify these environmental changes in the following table

Oil - Charcoal - Gasoline - Natural gas - Corn -
Grass - Wood - Coal - Water - Wind

Renewable Resource of Energy

Nonrenewable Resource of Energy

.....

.....

.....

.....

.....

.....

.....

.....

Arrange the following steps according to the formation of coal:

- () The tree has been transformed into coal over millions of years.
- () The tree remains are buried under the Earth's surface.
- () The tree remains are exposed to high pressure and temperature.
- () An old tree died.

Arrange the following steps according to the formation of oil:

- a) () They fall on the bottom of oceans.
- b) () The organisms are exposed to high pressure and temperature.
- c) () They are covered with rocks and sediments.
- d) () Some marine organisms died.
- e) () Over millions of years, these remains are transformed into oil.

Cross out the odd word:

- 1) Wood - Oil - Corn - Charcoal. ()
- 2) Sun - Wind - Water - Coal. ()
- 3) Coal - Charcoal - Natural gas - Oil. ()
- 4) Grass - Wood chips - Corn - Coal. ()

Compare between:

P.O.C	Fossil Fuel	Biofuel
Renewable or Nonrenewable		
Examples		



P.O.C

Coal

Type of Fuel

Primary Source

Renewable or
Nonrenewable

11 Give reasons for:

- 1 Fossil fuel is considered a nonrenewable resource of energy.
- 2 Biofuel is considered a renewable resource of energy.
- 3 Cutting trees at a faster rate to get wood has a negative impact on our environment.
- 4 Coal is considered a type of fossil fuel.

12 What happens if?

- 1 The marine creatures remainings decompose under the Earth's surface?
- 2 We cut down trees at a faster rate than they can grow?
- 3 The remains of dead plants are exposed to extreme heat and pressure?

Activity 6

Fossil Fuel Formation

The following are the steps involved in the formation of fossil fuel, write them in the correct order:

- () The remains are changed to become coal, oil, and natural gas.
- () The remains were buried.
- () Living things that lived a long time ago died.
- () Heat and pressure affected the remains.

Activity 7

Living Without Electricity

Electricity can be generated from

1 Renewable Resources

Such as
(Water - Wind)



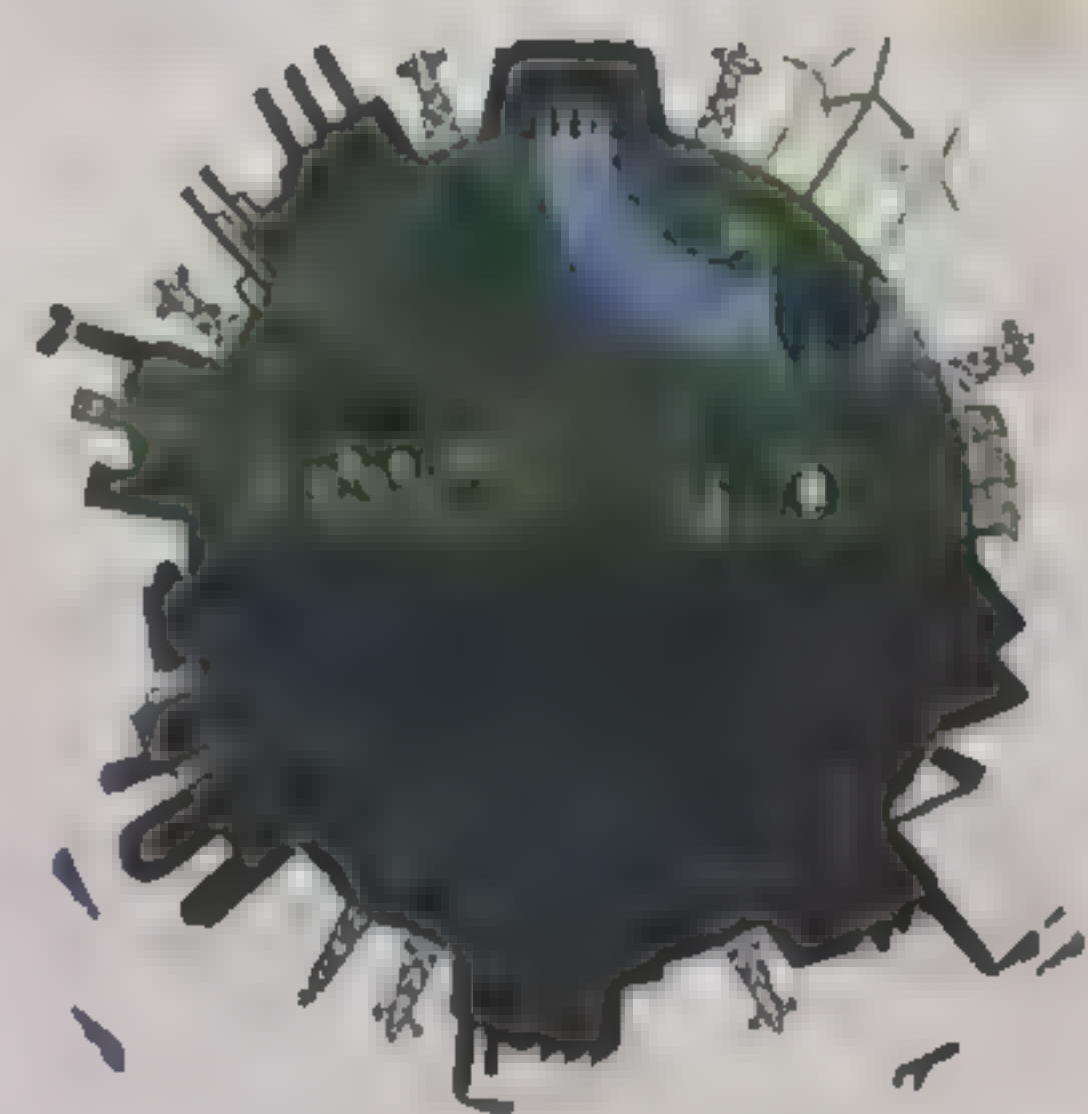
2 Nonrenewable Resources

Such as
(Oil - Natural gas)



- In many regions, electricity is generated from nonrenewable resources.
- Using renewable resources is beginning to increase.

Whatever the resource of energy is
renewable or nonrenewable,
we should conserve it.



Experiment



Unit 3

Unit

In this activity, we will document your experience of spending time without using electricity.

في هذا النشاط، سندocument تجربتك من قضاء بعض الوقت بدون استخدام الكهرباء.

Steps:

- 1 Turn off all the electricity in the house for two hours.
- 2 Write about your experience and answer the following questions.

Questions and answers:

a Do you see anything in the dark?

- I can't see anything in the dark.

b What are the devices you have used?

- I've used a candle instead of the lamp.

- I've used a paper and a pen instead of a computer.

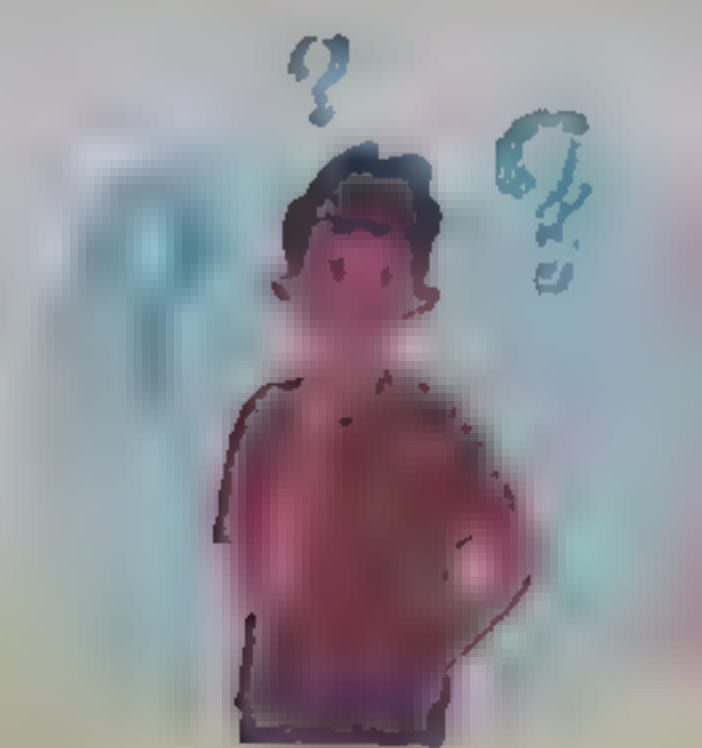
c How did you feel after this experience?

- I was bored and I appreciate electricity more now.

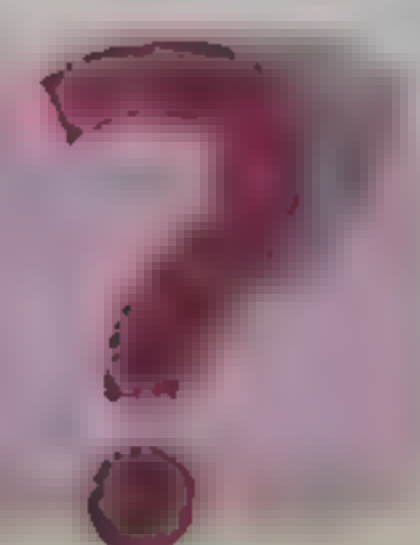


Conclusion:

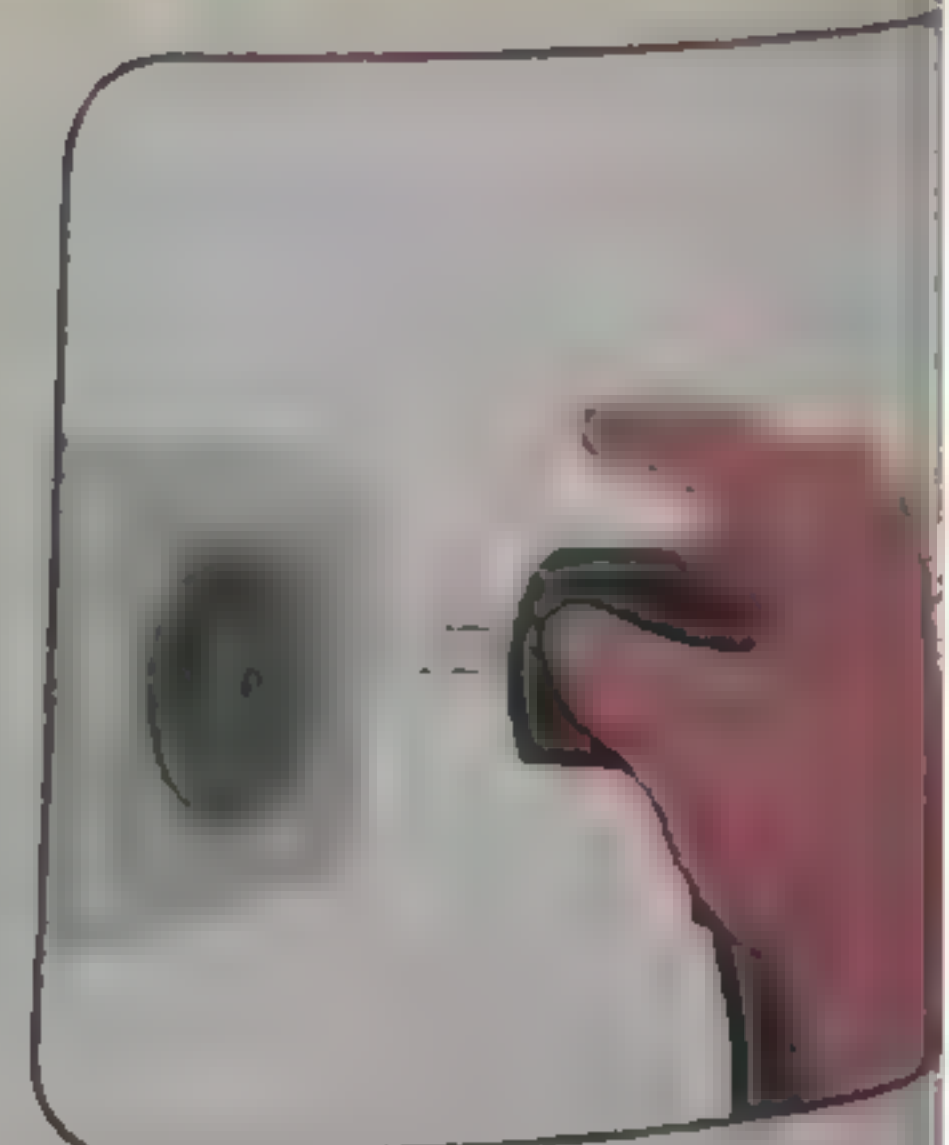
Electricity is very important in our lives and we should conserve it.

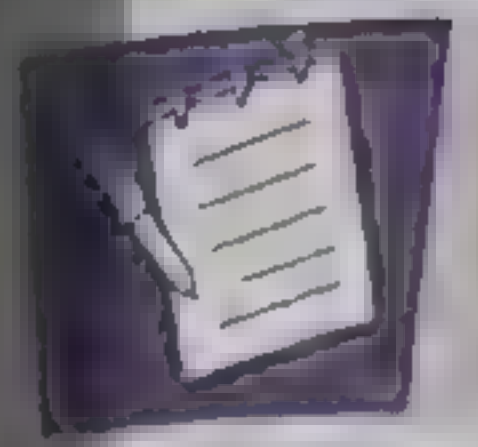


How can we conserve electricity?



- 1 Turn off the lights we don't need.
- 2 Unplug electrical devices after using them.
- 3 Set a regular electricity-free time.





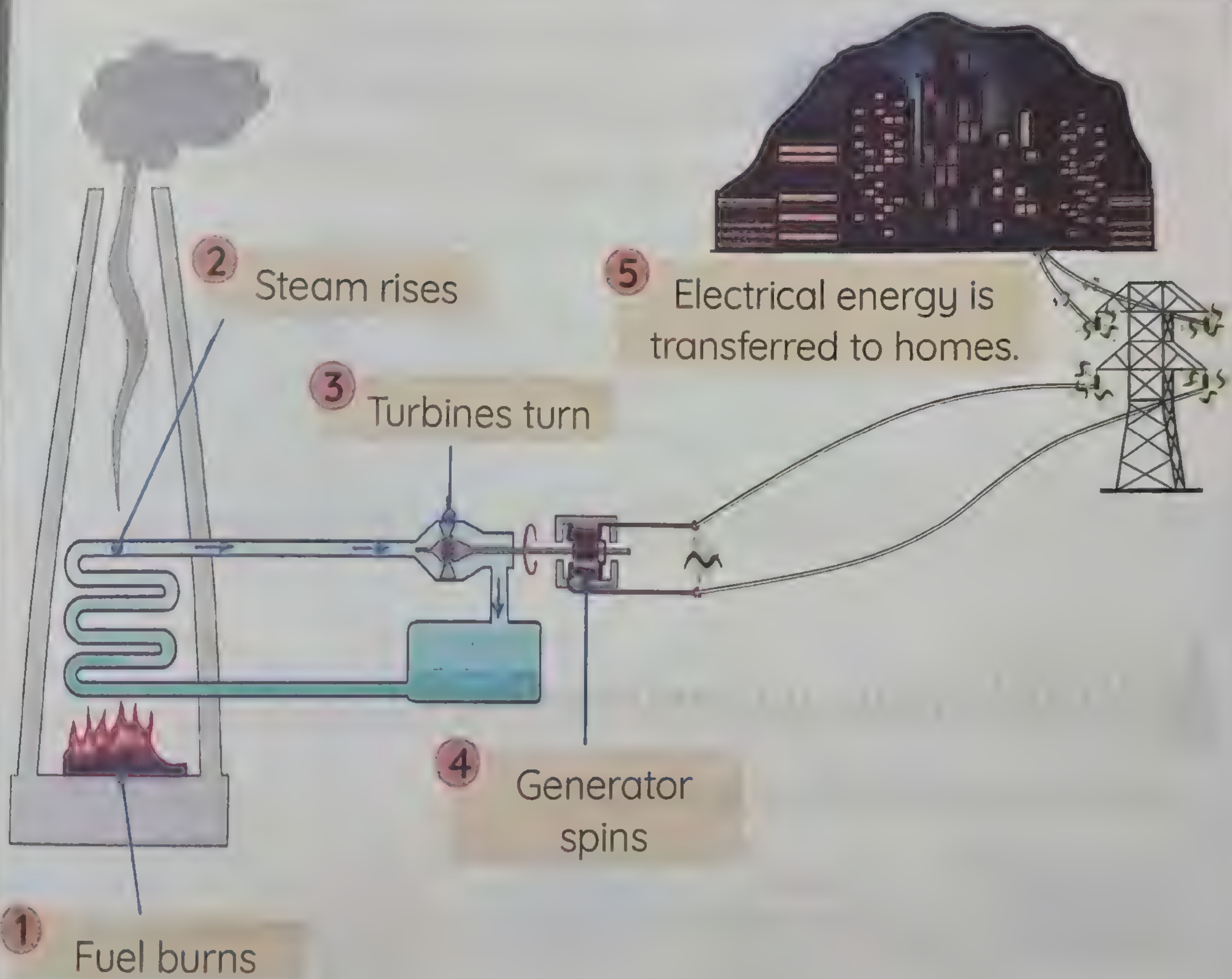
Activity 8 Using Fossil Fuel to Generate Electricity

Put (✓) or (X):

- 1 We should let electric devices work all the time. ()
- 2 We can conserve electricity by using saving light bulbs. ()

Concept 2

Generating Electricity Using Fossil Fuel



Energy and Fuel

1 Fuel burns

- When fuel (coal, oil, or natural gas) burns, it releases thermal energy.

2 Steam rises

- This thermal energy is used to heat water to produce steam.

3 Turbines turn

- The steam is directed to tubes to turn turbines.

4 Generator spins

- Turbines make the generator spin and convert kinetic energy into electrical energy.

5 Electrical energy is transferred to homes

- Electrical energy travels through cables to homes, businesses, and factories.

عندما يحترق الوقود (الفحم أو النفط أو الغاز الطبيعي) يُنتج طاقة حرارية.	حرق الوقود
تُستخدم هذه الطاقة الحرارية في تسخين المياه لتكوين بخار الماء.	يرتفع البخار
يُوجّه البخار إلى أنابيب لتشغيل التوربينات.	تتحرك التوربينات
تعمل التوربينات على دوران المولد؛ وبالتالي يتم تحويل الطاقة الحركية إلى طاقة كهربائية.	يدور المولد
تنتقل الطاقة الكهربائية عبر الكابلات إلى المنازل والشركات والمصانع.	نقل الطاقة الكهربائية للمنازل



Check your understanding?

Complete the following diagram:

Fuel
burns

energy
used to produce

directed to
tubes to turn

Make _____ spins, so _____ energy is converted into _____ energy which is transferred to homes through _____.

Exercises on Lesson 3

Choose the correct answer:

- 1 In many regions, is generated from nonrenewable resources.
a. oil **b.** natural gas **c.** electricity **d.** wood
- 2 is used instead of lamps when electricity is turned off.
a. Candle **b.** Wool **c.** Paper **d.** Radio
- 3 How can you conserve electricity?
a. By turning off the lights when I don't need them.
b. By unplugging electrical appliances.
c. By setting a regular electricity-free time.
d. All answers are correct.
- 4 energy is produced by burning fuel.
a. Chemical **b.** Sound **c.** Thermal **d.** Solar
- 5 By heating water, it turns into
a. steam **b.** ice **c.** electricity **d.** fuel
- 6 change kinetic energy into electrical energy in the power plants.
a. Engines **b.** Generators **c.** Wires **d.** Fuel
- 7 The steam produced in the electric power station is directed to tubes to turn
a. turbines **b.** motors **c.** mills **d.** lamps
- 8 Electrical energy travels through to homes and factories.
a. tubes **b.** motors **c.** cables **d.** fans
- 9 and are included in fossil fuel's formation.
a. Heating - cooling **b.** Burying - cooling
c. Decaying - heating **d.** Decaying - growth

- 10 Water is turned into steam by the effect of _____ energy.
 a. electrical b. thermal c. kinetic d. mechanical

Unit 3

2 Put (✓) or (X):

- 1 The movement of a generator in an electric power station produces potential energy. ()
- 2 Water is a nonrenewable resource. ()
- 3 We can use renewable and nonrenewable energy resources to generate electricity. ()
- 4 Turbines are operated by steam in electric power stations. ()
- 5 Turning on the lights that we do not need helps us conserve electricity. ()
- 6 Turbines make the generator spin to generate electrical energy. ()
- 7 Using energy-saving light bulbs conserves electricity. ()
- 8 You should unplug an electric iron after using it. ()
- 9 On cooling water, it turns into steam in electric power stations. ()

3 Write the scientific term:

- 1 The energy resources that include wind energy and water energy. ()
- 2 The energy released from burning fossil fuel. ()
- 3 The energy produced by the generator. ()
- 4 A matter that is produced from heating water in an electric power station. ()
- 5 A device that operate generators. ()
- 6 A device in an electric power station that changes the kinetic energy into electrical energy. ()

Complete the following using the words between the brackets:

(natural gas - generator - electric - coal - steam - kinetic)

- 1 Turbines in electric power stations are turned by _____, and they produce kinetic energy to run the _____ of the electric power stations.
- 2 The electric generator changes the _____ energy into _____ energy.
- 3 Electricity is generated by burning _____ or _____ in electric power stations.

Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1) Generators	a. produces thermal energy.
2) Turbines	b. produce electrical energy.
3) Burning fuel	c. is produced from heating water.
4) Steam	d. produce kinetic energy.

1 _____ 2 _____ 3 _____ 4 _____

Cross out the odd word:

- 1 Decomposition - Moonlight - Extreme heat - High pressure.

(_____)

- 2 Water - Oil - Coal - Natural gas.

(_____)

Arrange the following steps for generating electricity at an electric power station:

- 1 (_____) Steam starts to move the turbines.
- 2 (_____) The oil or natural gas burns to produce thermal energy.
- 3 (_____) Electricity is transferred through cables to cities.
- 4 (_____) The generator converts the kinetic energy into electrical energy.
- 5 (_____) Thermal energy is used to heat water and produce steam.

Energy and Fuel

8 Give reasons for:

1 We should conserve electricity.

2 Generators play an important role in the electric power stations.

9 What happens if?

1 Oil is burned inside the electric power stations?

2 Steam produced from heating water is directed towards turbines?

3 Water is heated in electric power stations?

4 A generator is operated by the movement of turbines?

Activity

Big City Environmental Concerns

- The increase in people's needs and their industrial and agricultural activities causes many pollution problems.

Sources of Pollution in Big Cities

1

Burning fuel produces smog that pollutes the air.



يُنْتَج عن حرق الوقود الضباب الدخاني الذي يلوث الهواء.

2

Pesticides used in farms are carried into streams when it rains, causing soil and water pollution.



المبيدات الحشرية المستخدمة في المزارع تختلط مع مياه الجداول عند سقوط الأمطار؛ مما يسبب تلوث التربة والمياه.

3

Using chemicals in factories pollutes the air, water, and soil.



المواد الكيميائية المستخدمة في المصانع تؤدي لتلوث الهواء والمياه والتربة.

Effects of Air Pollution on Humans' Health

Smog from cars and factories in big cities causes:

- Irritation of humans' eyes
- Irritation of humans' lungs
- Damages the tissues of the respiratory system.



يتسبب الضباب الدخاني الصادر من السيارات والمصانع في المدن الكبرى في:
 1 تهيج عيون الإنسان. 2 تهيج الرئة. 2 تدمير أنسجة الجهاز التنفسي.

NOTE:

- Smog is full of harmful small particles that irritate the lungs and cause damage to the tissues of the respiratory system.

Activity 10 Burning Fossil Fuel and Pollution

3

Unit

- Over time, the demand for energy has increased in order to supply electricity to homes, schools, businesses, and factories.
- The solution was to **generate electricity** by burning fossil fuel in power plants.



مع مرور الوقت، زاد الطلب على الطاقة من أجل توفير الكهرباء للمنازل والمدارس والشركات والمصانع.
الحل هو حرق الوقود الحفري في محطات توليد الكهرباء لتوليد الكهرباء.

Harms of Burning Fossil Fuel

- » Burning fuel produces **carbon dioxide gas**, which is considered the main reason for **acid rain** and **global warming**.

1 Acid Rain:

How it is formed:

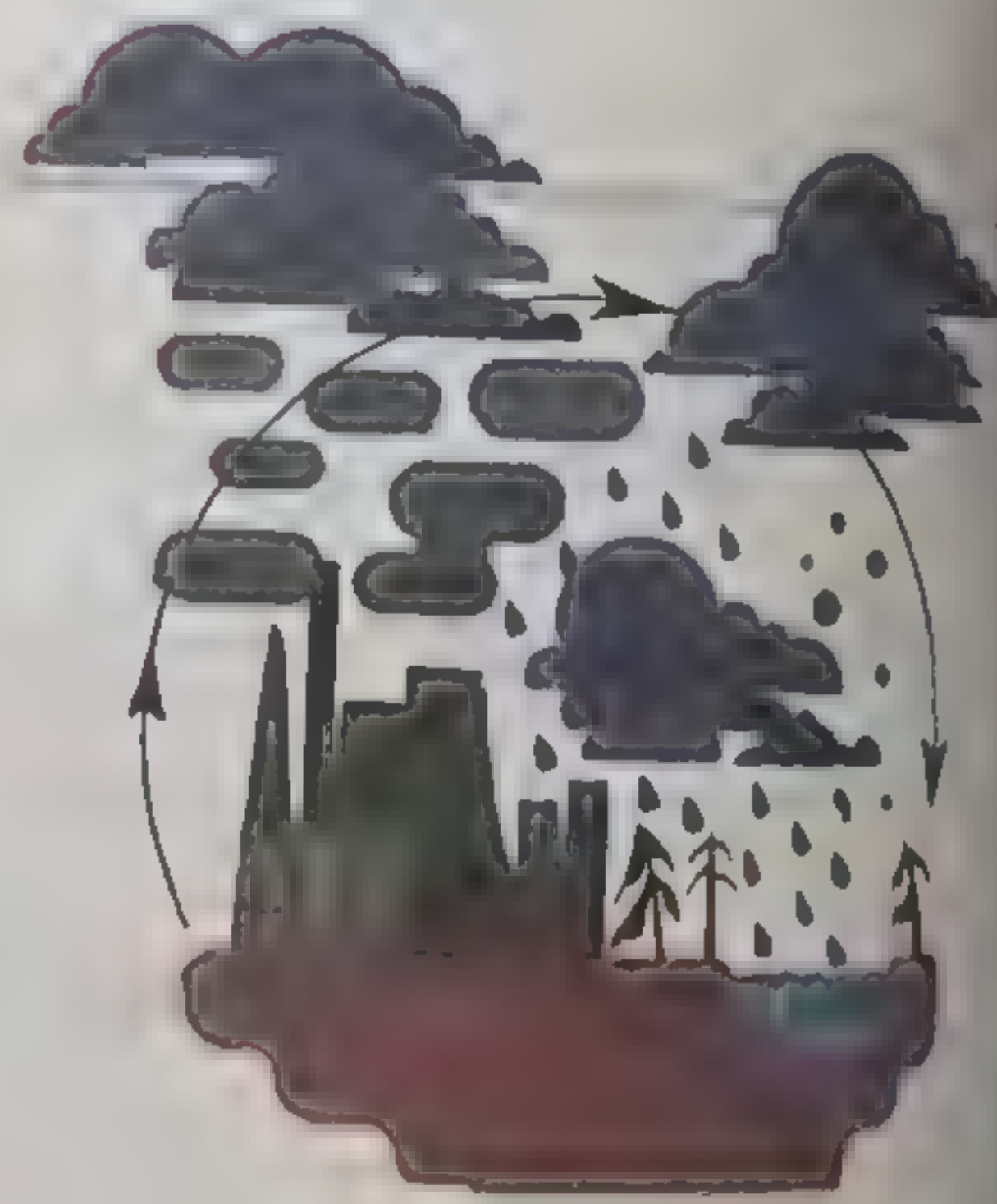
- Carbon dioxide gas combines with water in the air to form **acid rain**.

Harms:

- 1 The death of trees.
- 2 Chemical changes in the structure of the soil.
- 3 Chemical changes in the structure of lakes cause the death of fish.
- 4 Decomposition of some rocks, including bricks of buildings.

موت الأشجار. [2] التغيرات الكيميائية في تركيب التربة. [3] التغيرات الكيميائية في تركيب البحيرات؛ مما تسبب في موت الأسماك.

تتحلل بعض الصخور وطوب المباني.



2 Global Warming:

How it is formed:

- 1 The amount of carbon dioxide gas in the air increases forming a layer in the atmosphere.
- 2 This layer traps heat on the Earth, causing a slow rise in the Earth's temperature.



- 1 تزداد كمية غاز ثاني أكسيد الكربون في الهواء مُكوِّناً طبقة في الغلاف الجوي.
- 2 تُحبس هذه الطبقة الحرارة على الأرض؛ مما يؤدي إلى ارتفاع درجة حرارة الأرض ببطء.



How to reduce acid rain and global warming ?



- The only solution is to **conserve energy**.

الحل الوحيد لوقف الأمطار الحمضية والاحتباس الحراري هو الحفاظ على الطاقة.

Reducing energy we use.

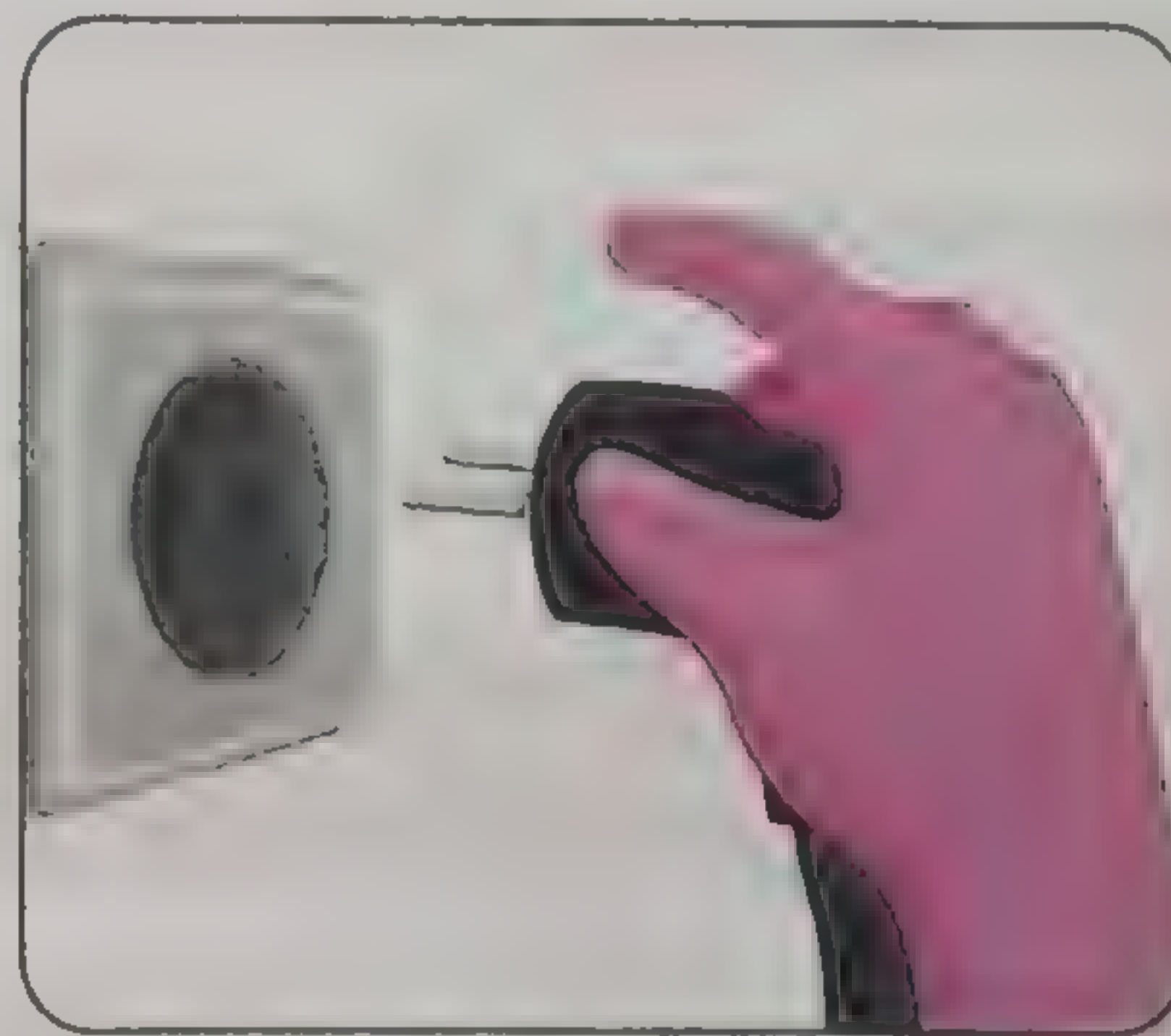
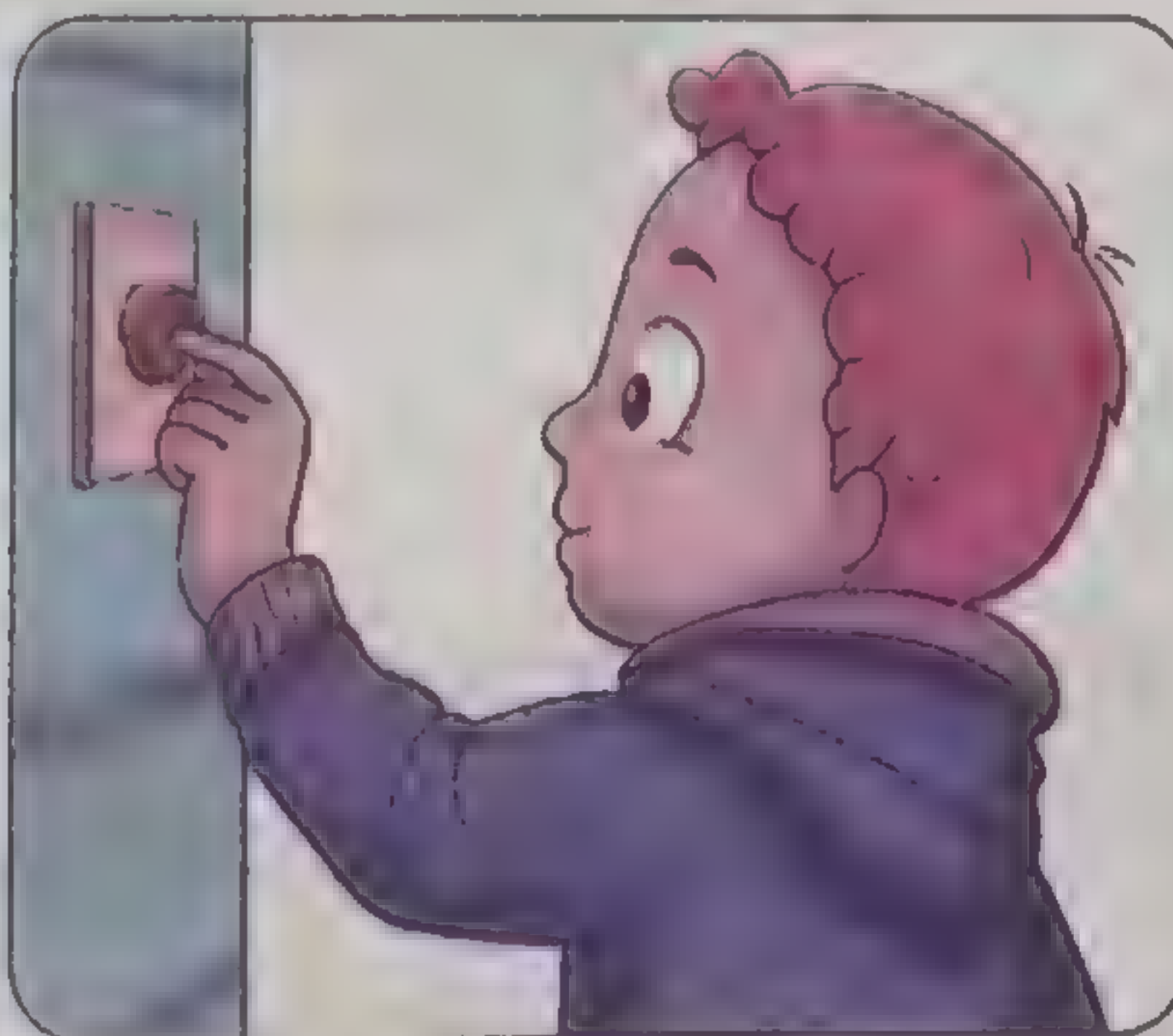
causes

Reducing the fossil fuel we burn.

causes

Reducing carbon dioxide we put in the air.

ترشيد استهلاك الطاقة يُقلل حرق الوقود؛ مما يُقلل كمية غاز ثاني أكسيد الكربون في الهواء.



- Conserving fossil fuel makes them last longer and keeps the Earth clean.

الحفاظ على الوقود يجعله يدوم لفترة أطول ويمنع تلوث كوكب الأرض.



Activity 11 Conserving Fossil Fuel

Unit 3

From the previous lessons, we have learned that:

- » Fossil fuel is considered nonrenewable natural resource of energy.
- » Fossil fuel takes millions of years to form, which means that they cannot be replaced as quickly as we consume them.
- » Fossil fuel will run out of the Earth if consumption is not rationalized.

Conserving Fossil Fuel

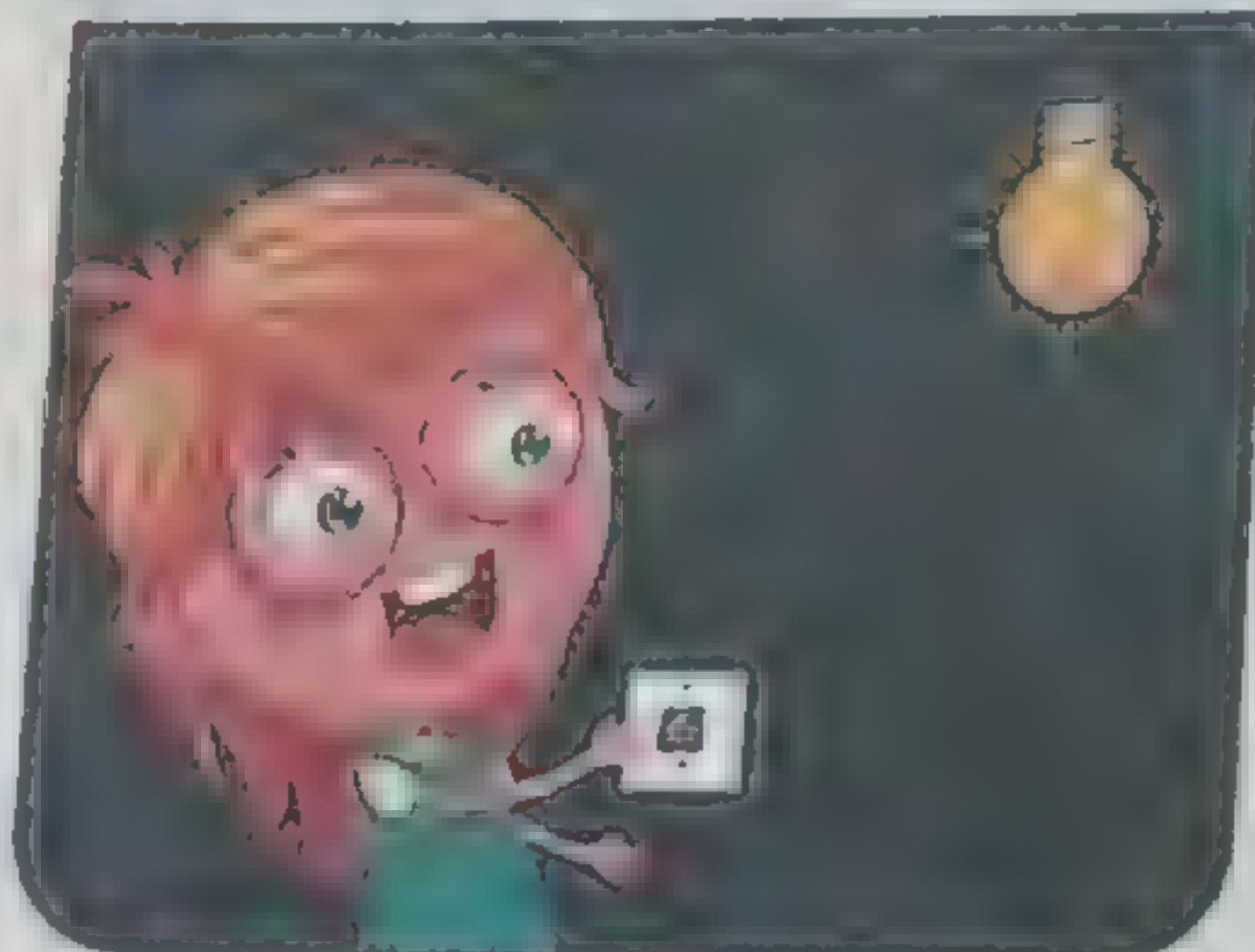
1

Walking or biking instead of driving a car.



2

Turning off the lights when you aren't in a room.



3

Replacing fossil fuel with renewable energy resources, such as:

- 1 Solar energy.
- 2 Hydroelectric energy.
- 3 Wind energy.



NOTE:

- Using renewable energy resources to generate electricity is more expensive than using fossil fuel.

Disadvantages of Using Fossil Fuel

- 1 Fossil fuel is limited and could run out.
- 2 When fossil fuel burns, it emits gases that cause:
 - a. Air pollution
 - b. Acid rain
 - c. Global warming



Activity



Using Fuel

Classify the following resources in the following table:

P.O.C	Renewable	Nonrenewable
1 Coal		✓
2 Charcoal		
3 Wood		
4 Oil		
5 Natural gas		
6 Solar energy		
7 Wind energy		
8 Gasoline		
9 Water		
10 Liquid fuel		



Activity 13 Record Evidence Like a Scientist

3

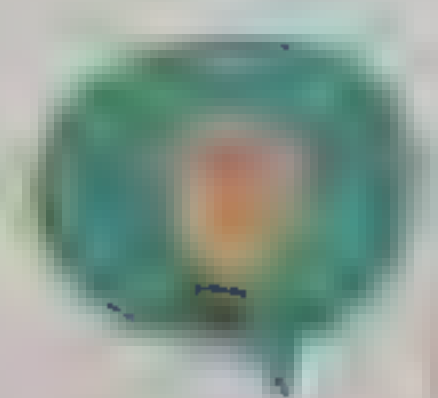
Unit

» Now, try to think like a scientist by writing your hypothesis (claim), your evidence, and your scientific explanation about one of the points of this concept.



Question:

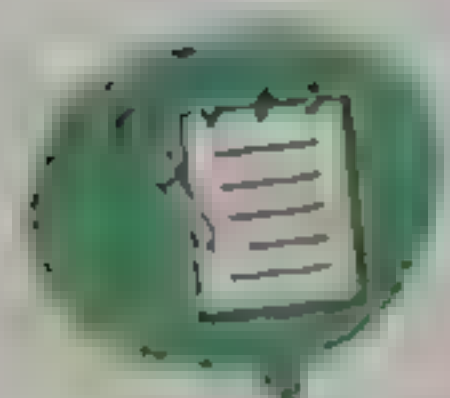
» How can you describe fuel and road trips now?



My Claim:



Evidence:



Scientific Explanation with Reasoning:



Exercises on Lessons 4 and 5

Choose the correct answer:

- 1 Using chemicals in factories pollutes
a. air
b. water
c. soil
d. all the previous
- 2 Smog damages the tissues of the system.
a. digestive
b. circulatory
c. respiratory
d. nervous
- 3 Burning fossil fuel produces
a. natural gas
b. oxygen gas
c. carbon dioxide
d. oil
- 4 The death of trees is a result of
a. overfishing
b. acid rain
c. wind
d. temperature
- 5 Cars' smog causes irritation of humans'
a. small intestine
b. brains
c. hearts
d. eyes
- 6 Acid rain is formed when combines with water.
a. oxygen
b. carbon dioxide
c. hydrogen
d. nitrogen
- 7 The burning of fossil fuel causes
a. global warming
b. deforestations
c. acid rain
d. a and c
- 8 To reduce air pollution and global warming, we must
a. not use public transportation
b. turn on all home devices
c. drive cars faster
d. conserve fossil fuel
- 9 Using vehicles that are operated by conserves fossil fuel.
a. natural gas
b. solar energy
c. electricity
d. b and c
- 10 Increasing the amount of gas in the atmosphere causes global warming.
a. hydrogen
b. carbon dioxide
c. oxygen
d. nitrogen
- 11 Erosion of buildings and chemical changes in the soil are caused by
a. global warming
b. oxygen gas
c. deforestation
d. acid rain

- 12 When _____ mixes with water of canals and rivers, it causes _____ and soil pollution.
 a. carbon dioxide b. smog c. pesticides d. rain
- 13 Carbon dioxide traps _____ in the atmosphere causes global warming.
 a. gases b. water vapor c. pressure d. heat
- 14 Using _____ to produce electric energy is expensive.
 a. solar energy b. oil c. natural gas d. coal
- 15 Burning fossil fuel produces _____.
 a. thermal energy b. carbon dioxide
 c. chemical energy d. a and b
- 16 Burning fossil fuel causes all the following, except _____.
 a. pollution b. acid rain
 c. global warming d. deforestation

2 Put (✓) or (X):

- 1 Acid rain causes soil and water pollution. ()
- 2 When the burning rate of fossil fuel increases, the temperature of Earth decreases. ()
- 3 Mixing water with oxygen gas produces acid rain. ()
- 4 Acid rain can decompose some rocks. ()
- 5 To reduce global warming, we must conserve nonrenewable resources of energy. ()
- 6 The amount of fossil fuel on Earth is unlimited. ()
- 7 Increasing the ratio of carbon dioxide in the air reduces the Earth's temperature. ()
- 8 Acid rain leads to physical changes in the structure of lakes and soil. ()
- 9 Burning fossil fuel causes global warming. ()
- 10 Global warming is one of the disadvantages of using fossil fuel in energy generation. ()
- 11 Acid rain irritates the humans' eyes and lungs. ()
- 12 Large particles found in smog cause air pollution. ()

Write the scientific term:

- 1 It is a phenomenon in which the Earth's temperature increases, when carbon dioxide gas increases in the air. ()
- 2 It is a substance that causes the decomposition of some rocks and the death of trees. ()
- 3 A gas that causes global warming and acid rain. ()
- 4 The energy resources that include solar energy and hydroelectricity. ()
- 5 The energy resources that include all kinds of fossil fuel. ()
- 6 It is released from cars and irritates humans' eyes and lungs. ()

Complete the following using the words between the brackets:

(climate - water - soil - renewable - air - nonrenewable - temperature)

- 1 To avoid air pollution, we must use resources of energy.
- 2 Global warming is a phenomenon that raises the of Earth and changes its
- 3 Smog causes pollution.
- 4 Pesticides cause and pollution.

Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 Oil	a. causes global warming.
2 Water	b. runs out faster than wind.
3 Carbon dioxide	c. irritates our lungs.
4 Smog	d. is a renewable resource.

1 2 3 4

6 Arrange the following steps that explain formation of acid rain.

- () The ratio of carbon dioxide gas increases.
- () Acid rain is formed.
- () Carbon dioxide combines with water vapor.
- () It causes the death of trees and fish.
- () Factories cause air pollution.

7 Compare between:

P.O.C	Acid Rain	Global Warming
Reason of Formation		
Disadvantages		

8 Give reasons for:

- It is necessary to conserve energy.
- Fossil fuel amount on Earth is limited.
- Engineers work on improving solar vehicles.
- Farmers should avoid the overuse of pesticides.

9 What happens if?

- The ratio of carbon dioxide increases in the air?
- The consumption of fossil fuel is not rationalized?
- Acid rain falls on buildings?
- Factories discharge a lot amount of chemicals into a city?

Model Exams

(on) Concept (3.2)

Model Exam 1

Question (1)

(A) Choose the correct answer:

1. Ancient people used _____ as a form of fuel before discovering gasoline.
a. oil b. coal c. charcoal d. wood
2. Fuel is used as a source of _____ energy.
a. thermal b. chemical c. light d. a and c
3. If we are going on a long trip in the car, we must check the _____.
a. seats b. airbag c. speedometer d. gasoline pump
4. _____ takes millions of years to be formed.
a. Coal b. Charcoal c. Wood d. Corn

(B) Write the scientific term:

A device in the electric power station that changes the kinetic energy into electrical energy. (_____)

Question (2)

(A) Put (✓) or (X):

1. As the speed of the car increases, the amount of used fuel decreases. ()
2. Fossil fuel are made from living things that can be planted. ()
3. When the burning of fossil fuel increases, the temperature on Earth decreases. ()
4. Using energy-saving light bulbs conserves electricity. ()

(B) Cross out the odd word: Coal - Charcoal - Natural gas - Oil.

Question (3)

(A) Choose from column (A) what suits it in column (B):

(A)	(B)
1. Liquid fuel	a. was used by ancient people.
2. Gasoline	b. is made from grass, corn, and wood chips.
3. Charcoal	c. is a fuel that is made from oil.
4. Wood	d. is made from wood.

(B) Give a reason for:

Fossil fuel is considered a nonrenewable resource of energy.

Model Exam 2

Question 1

(A) Choose the correct answer:

1. All the following are found deeply under the Earth's surface.
 - a. coal
 - b. oil
 - c. natural gas
 - d. green
2. _____ is considered the main source of energy on the Earth's surface.
 - a. Wind
 - b. Fuel
 - c. The Sun
 - d. Water
3. One of the disadvantages of overusing biofuel is _____.
 - a. overfishing
 - b. wildfire
 - c. deforestation
 - d. acid rain
4. Coal is formed underground due to the decomposition of dead _____.
 - a. plants
 - b. animals
 - c. humans
 - d. birds

(B) Write the scientific term:

The energy resources that include all kinds of fossil fuel.

Question 2

(A) Put (✓) or (X):

1. All types of fuel are extracted from underground.
2. When cooling water, it turns into steam in electric power stations.
3. The amount of fossil fuel is limited on the Earth.
4. Thermal energy is produced from burning a piece of wood.

(B) Cross out the odd word: Sun - Wind - Water - Coal.

Question 3

(A) Arrange the following steps according to the formation of oil:

- a. (.....) They fall to the bottom of oceans.
- b. (.....) The organisms are exposed to high pressure and temperature.
- c. (.....) They are covered with rocks and sediments.
- d. (.....) Some marine organisms died.
- e. (.....) Over millions of years, these remains have been transformed into oil.

(B) What happens if?

The remains of dead plants are exposed to extreme heat and pressure for millions of years?



Concept 3

Renewable Energy Resources

Concept Objectives:

By the end of this concept:

- Students can apply scientific ideas to design, test, and refine devices that convert energy from one form to another.
- Students can explain the use of renewable resources in the generation of electricity.
- Students can develop models based on observations and evidence that energy is transferred from one place to another.

Key Vocabulary:

- Heat
- Light
- Radiation
- Solar energy
- Turbine
- Watermills
- Windmills

Concept

3

Renewable Energy Resources

Lesson 1

- Activity 1 Can You Explain?
- Activity 2 Windmills and Watermills
- Activity 3 Using Energy from the Sun

Lesson 2

- Activity 4 Solar Energy
- Activity 5 Harness the Wind

Lesson 3

- Activity 6 Falling Water
- Activity 7 Hands-on Investigation: Modeling a Turbine Generator

Lesson 4

- Activity 8 Record Evidence Like a Scientist: Windmills and Watermills

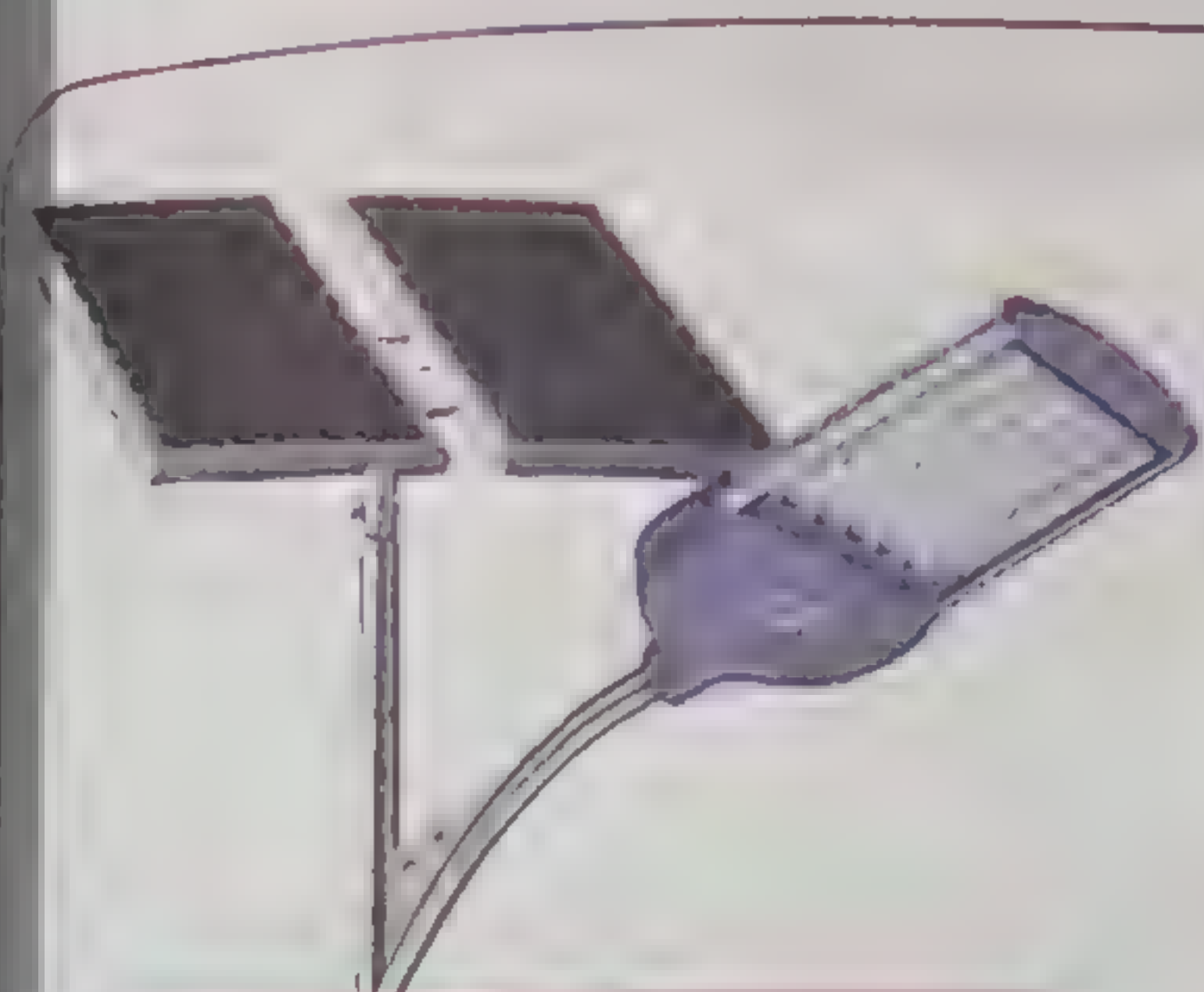
Activity 1 Can You Explain?

» In the previous concept, we have learned that:

Renewable resources of energy:

They are natural resources that are replaced (renewed) in a faster rate than that of being consumed.

» We can generate electricity using different renewable energy resources. Such as:



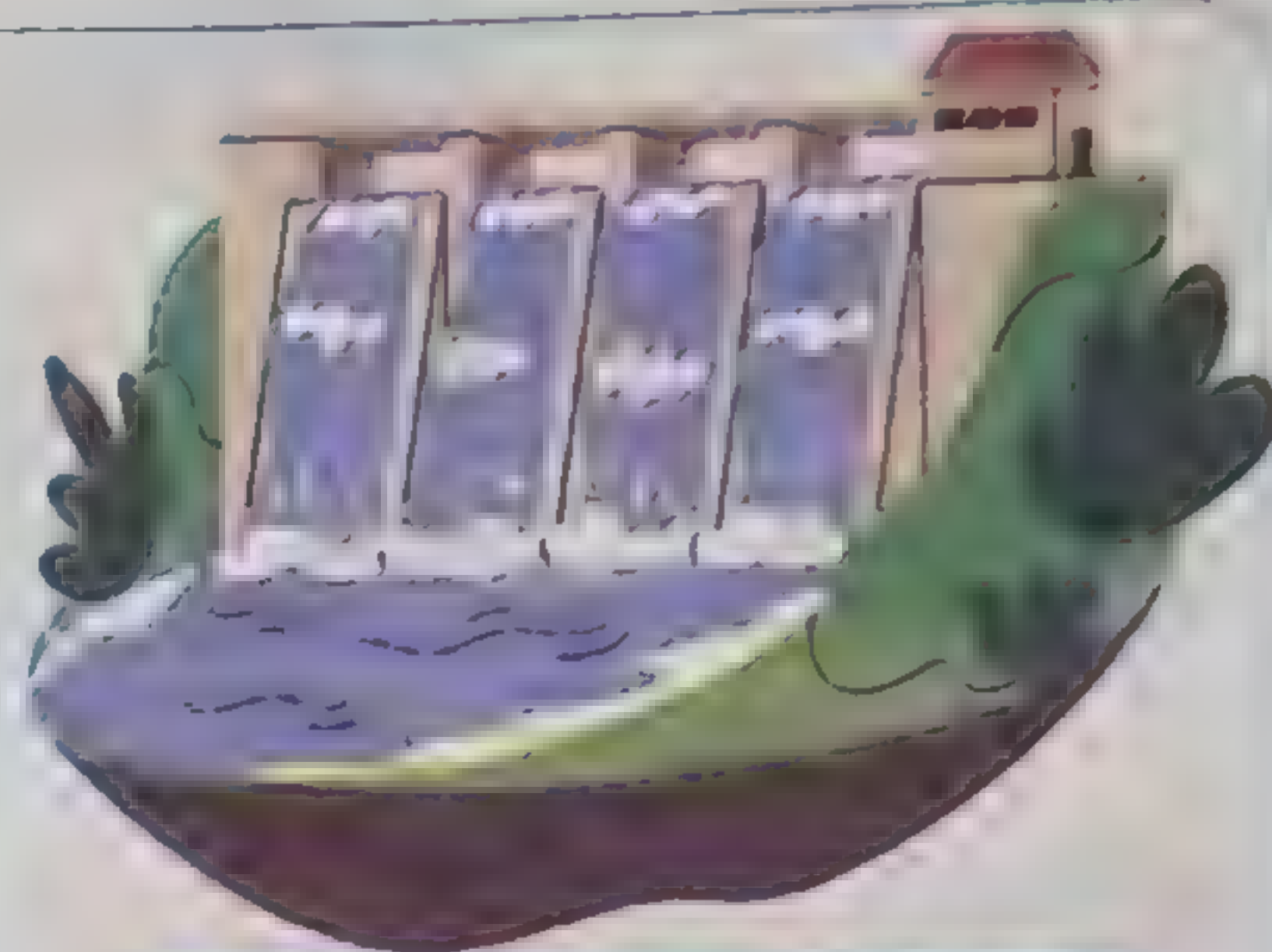
Solar Panels

Generate electricity to light streets using solar energy.



Wind Turbines

Generate electricity using the kinetic energy of wind.



Water Turbines

Generate electricity using the kinetic energy of water.



In this concept we will study:

- » Renewable energy and its resources.
- » Wind turbines and water turbines.
- » The uses of solar energy.
- » Generating electricity using the wind's movement.
- » Generating electricity using the water's movement.

Activity 2 Windmills and Watermills

Unit 3

Imagine you were born 400 years ago.

- Life was hard, and people needed machines to make their lives easier.
- Windmills and watermills were used to crush grain to make flour.

Windmill



Watermill



Way of working

1 The wind moves the mill's blades.

2 The kinetic energy transfers to the internal parts of the mill.

1 The water moves the mill's blades.

2 The kinetic energy transfers to the internal parts of the mill.

Importance

- They are used to crush (grind) grains and make flour.



Advantages

- Low cost.
- Renewable energy resource.

Disadvantages



Sometimes the wind doesn't blow, so it can't do its main job.

Sometimes, the water supply may dry up, so it can't do its main job.

Machines

الآلات

Windmill

الطواحين الهوائية

Watermill

الطواحين المائية

Blades

شفرات

Internal Parts

الأجزاء الداخلية

Cost

تكلفة

Blow

تهب

Dry up

تجف

Modern turbines are used now instead of old windmills.

① Modern Wind turbines



② Old Windmill



Function

- They are used to generate electricity.

- They are used to grind the grains to make flour.

Differences

- They are taller than windmills.
- They have fewer blades than windmills.
- They have no opening in their blades.

- They are shorter than wind turbines.
- They have more blades than wind turbines.
- They have openings in their blades.

Similarity

- They depend on the kinetic energy of wind to be operated.

Check your understanding?

» Study the opposite figures, then complete:

① Figure () uses electricity to make wind.

② Figure () uses wind to make electricity.

③ The device in figure () is used to generate electricity that is used to operate the device in figure ().



(1)



(2)

Modern turbines	التوربينات الحديثة	Old windmills	الطواحين القديمة
Function	الوظيفة	Openings	فتحات



Activity 3 Using Energy From the Sun

- » The Sun is the main source of all kinds of energy on the Earth.
- » The Sun provides us with light and heat.



Even at night, you feel the warmth of the Sun.

Because the atmosphere, water, and Earth's surface absorb the Sun's energy, causing a rise in the Earth's temperature.

Solar Energy

- Energy received from the Sun is called solar energy.
- We can use solar energy as a source of thermal energy.
- Sun rays are called radiant energy (radiation).



يُزِل على الطاقة الصادرة من الشمس الطاقة الشمسية.
نُحْدِم الطاقة الشمسية كمصدر للحصول على الطاقة الحرارية.
يُزِل على أشعة الشمس الإشعاع أو الطاقة الإشعاعية.

Uses of Solar Energy

Greenhouses



Warming



Cooking food



Heating water



Greenhouses:

Importance

- They help farmers plant the crops that only grow in **warm** climates.



How does it work?

- 1 A greenhouse allows the entry of light and radiant energy from the Sun.
- 2 Radiant energy changes into thermal energy inside it.
- 3 Thermal energy warms the greenhouse from inside.

• الأهمية:

تساعد المزارعين على زراعة المحاصيل التي لا تنمو إلا في المناخ الدافئ.

• كيفية عمله:

1 تسمح الصوبة الزراعية بمرور الضوء والطاقة الإشعاعية للشمس.

2 تتحول الطاقة الإشعاعية إلى طاقة حرارية.

3 تقوم الطاقة الحرارية بتدفئة الصوبة الزراعية من الداخل.

2 Warming:

a Warming Ourselves



- Solar energy can be used directly as a source of thermal energy when exposing yourself to the Sun to feel warm.

• يمكن استخدام الطاقة الشمسية مباشرة كمصدر للطاقة الحرارية عند تعريض نفسك للشمس لتشعر بالدفء.

b Warming Houses



- Houses can be built in a way that enables the energy of the Sun to warm them by placing **large windows** on the wall that faces the Sun.

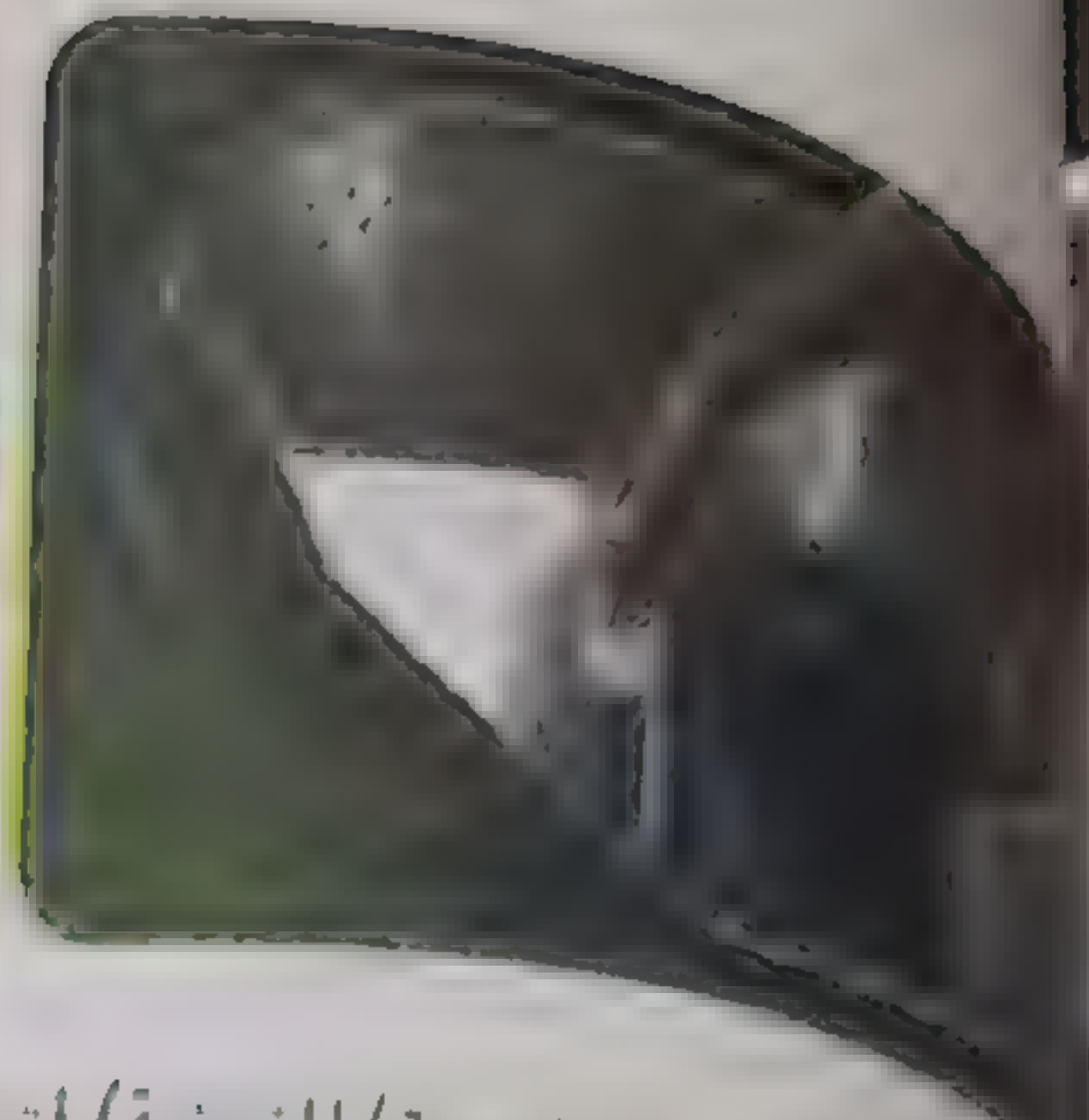
• يمكن بناء المنازل بطريقة تُمكن طاقة الشمس من تدفئتها بوضع نوافذ كبيرة على الحوائط المواجهة للشمس.

3 Cooking Food:

Convergent (concave/curved) mirrors:

- They collect and focus sunlight to heat a metal pot and cook the food inside.

المرآيا المجمعة (المقعرة/المنحنية) لتوجيه أشعة الشمس لأواني الطهي لطهي الطعام بداخلها.



4 Heating Water:

Solar water heater:

Structure:

- It contains panels made of black pipes.

Location:

- It can be placed on the roof of a house.

How does it work?

- 1 As water passes through the pipes, it heats up.
- 2 Water can then be stored in a hot water tank to be used later.

التركيب: تتكوّن من ألواح شمسية مصنوعة من أنابيب سوداء.

الموقع: تُوضع على أسطح المنازل.

كيفية عملها:

1 يتم تسخين الماء عندما يمر عبر تلك الأنابيب.

2 يتم تخزين الماء الساخن في خزان الماء الساخن للاستخدام في وقت لاحق.



Check your understanding?

Put (✓) or (X):

- 1 The output energy of a solar water heater is thermal energy. ()
- 2 We feel the warmth of the Sun because it is visible all day. ()

Exercises on Lesson 1

Choose the correct answer:

- 1 All the following are considered renewable resources of energy, except
- a. wind b. coal c. the Sun d. water
- 2 Which of these is an example of a renewable energy resource?
- a. Gold b. Petroleum c. Water d. Aluminium
- 3 The main function of is grinding the grains and making flour.
- a. modern turbines b. solar panels
c. dams d. watermills
- 4 Both modern wind turbines and old windmills are similar in their
- a. blades number b. ways of working
c. height d. blades shape
- 5 One of the disadvantages of wind energy is that
- a. its cost is high b. it does not blow sometimes
c. it can't be renewed d. it is limited
- 6 In wind turbines, the energy of the wind is changed into electrical energy.
- a. kinetic b. thermal c. sound d. light
- 7 Modern turbines are than old windmills.
- a. longer b. shorter c. heavier d. slower
- 8 The source of all energies on the Earth is/are
- a. planets b. the moon c. the Sun d. stars
- 9 Which of the following structures is used by humans to capture and use sunlight as an energy resource?
- a. Cranes b. Dams c. Solar cells d. Turbines
- 10 Using concave mirrors in cooking is one of the benefits of using
- a. wind b. water c. sand d. solar energy

Energy and Fuel

Unit 3

- 11 The output of solar panels is _____ energy.
a. solar b. electrical c. sound d. light
- 12 Solar energy is used in _____ food.
a. cooling b. preserving c. cooking d. freezing
- 13 In winter, greenhouses help farmers grow plants that need
a. warm weather b. cold weather
c. less water d. less sunlight

2 Put (✓) or (X):

- 1 Windmills can do their job all the time, as the wind never stops blowing. ()
- 2 When the kinetic energy of the wind increases, the windmill blades rotate faster. ()
- 3 Both modern wind turbines and old windmills are used to generate electricity. ()
- 4 Electricity generated by wind turbines is transmitted through the power lines. ()
- 5 The power source for the electric fan is wind. ()
- 6 Turbines convert kinetic energy into electrical energy. ()
- 7 Modern wind turbines are shorter than the old windmills. ()
- 8 Greenhouses help farmers grow plants that need cold weather. ()
- 9 We use solar energy to preserve food. ()
- 10 We feel the warmth of the Sun during the day only. ()

3 Write the scientific term:

- 1 The energy resources that include wind energy and water energy. ()
- 2 The primary source of energy on Earth. ()
- 3 They are used to collect and focus sunrays towards the cooking pot. ()
- 4 A device that the wind rotates its blades for generating electricity. ()
- 5 A device that consists of black pipes used to heat water. ()

Complete the following sentences:

- 1 When the wind turbines rotate, _____ energy is converted into _____ energy.
- 2 Both wind and water movement produce _____ energy, which is used to rotate turbines to generate _____ energy.
- 3 Renewable energy resources include _____ and _____.
- 4 _____ and _____ are nonrenewable resources of energy.
- 5 Old windmills are _____ than modern wind turbines.
- 6 The number of blades in modern wind turbines is _____ than in old windmills.
- 7 We can use solar energy in cooking using concave _____, which collect and focus the _____ onto the metal pots to heat them.
- 8 _____ help farmers grow crops that need warm weather.

Give an example for each of the following:

- 1 A renewable resource of energy (_____)
- 2 A nonrenewable resource of energy (_____)

Compare between:

P.O.C	Old Windmills	Wind Turbines
Function		
Number of Blades		
Height		

7 Choose from column (A) what suits it in column (B):

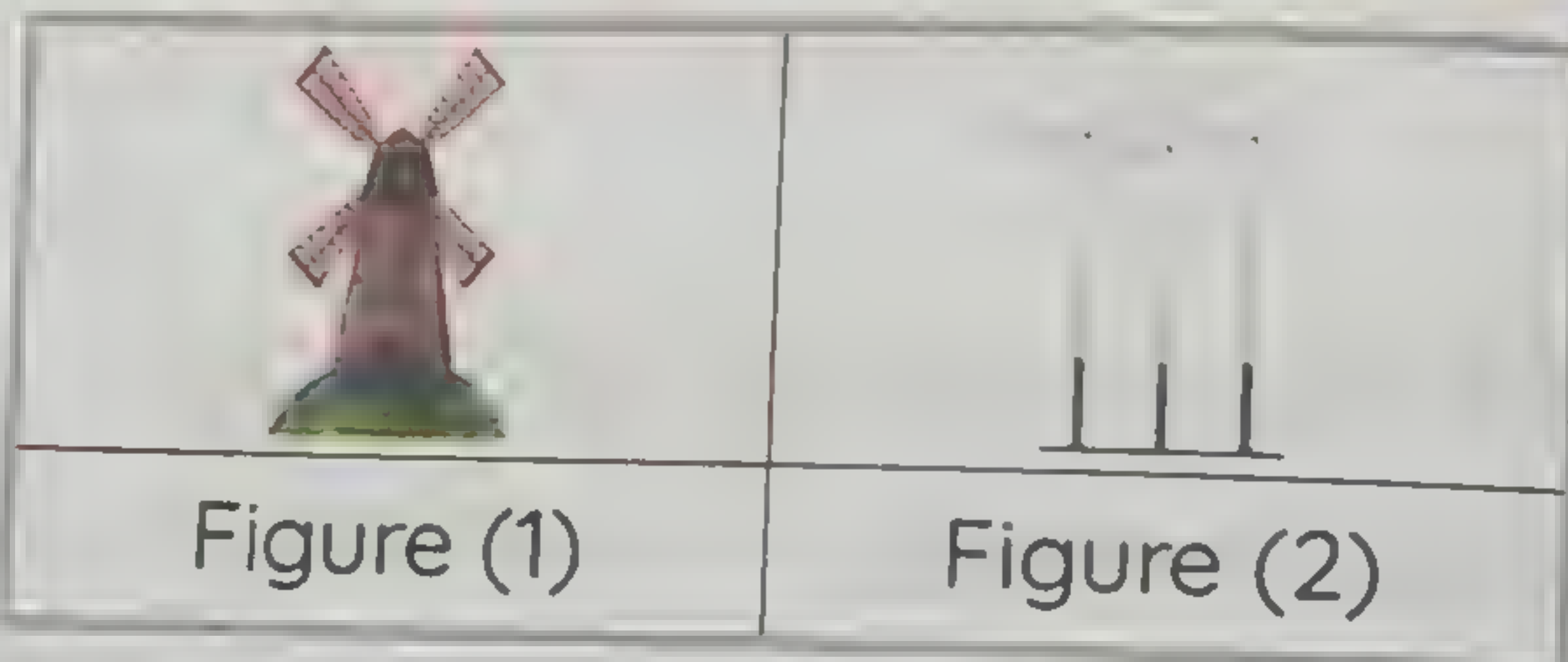
A

Column (A)	Column (B)
1 Wind turbines	a. were used to grind grains.
2 Solar panels	b. convert the kinetic energy of wind into electrical energy.
3 Old windmills	c. are used in heating water.
1 _____	2 _____
2 _____	3 _____

B

Column (A)	Column (B)
1 Greenhouses	a. are used in heating water.
2 Concave mirrors	b. are used in planting some kinds of crops.
3 Panels of black pipes	c. are used in cooking food.
1 _____	2 _____
2 _____	3 _____

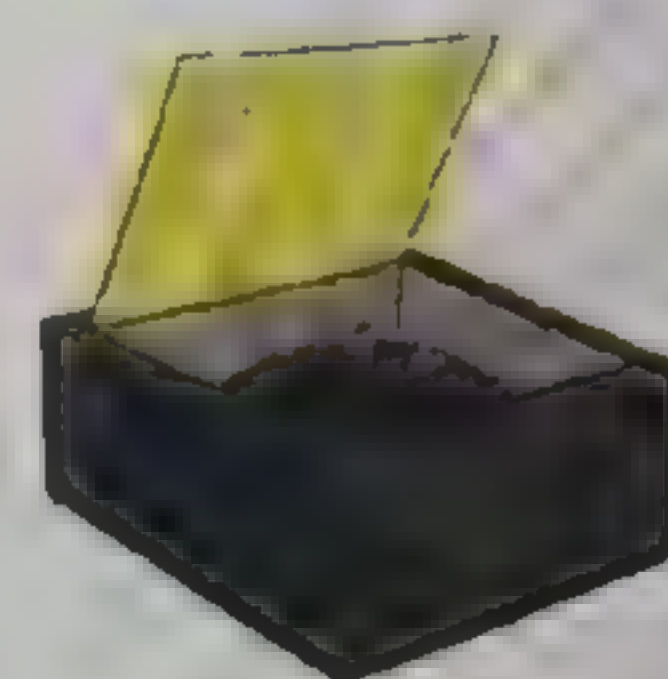
8 Study the following devices, then complete the sentences below:



- Figure (_____) is used to grind grains.
- Machine in figure (_____) is shorter than machine in figure (_____).
- Both of them are similar in _____.
- Both of them depend on _____.

9 Study the following figures, then answer the questions below:

- The opposite figure represents a solar oven:
 - What is the type of the mirror that is used in this device?
 - What is the importance of this device?

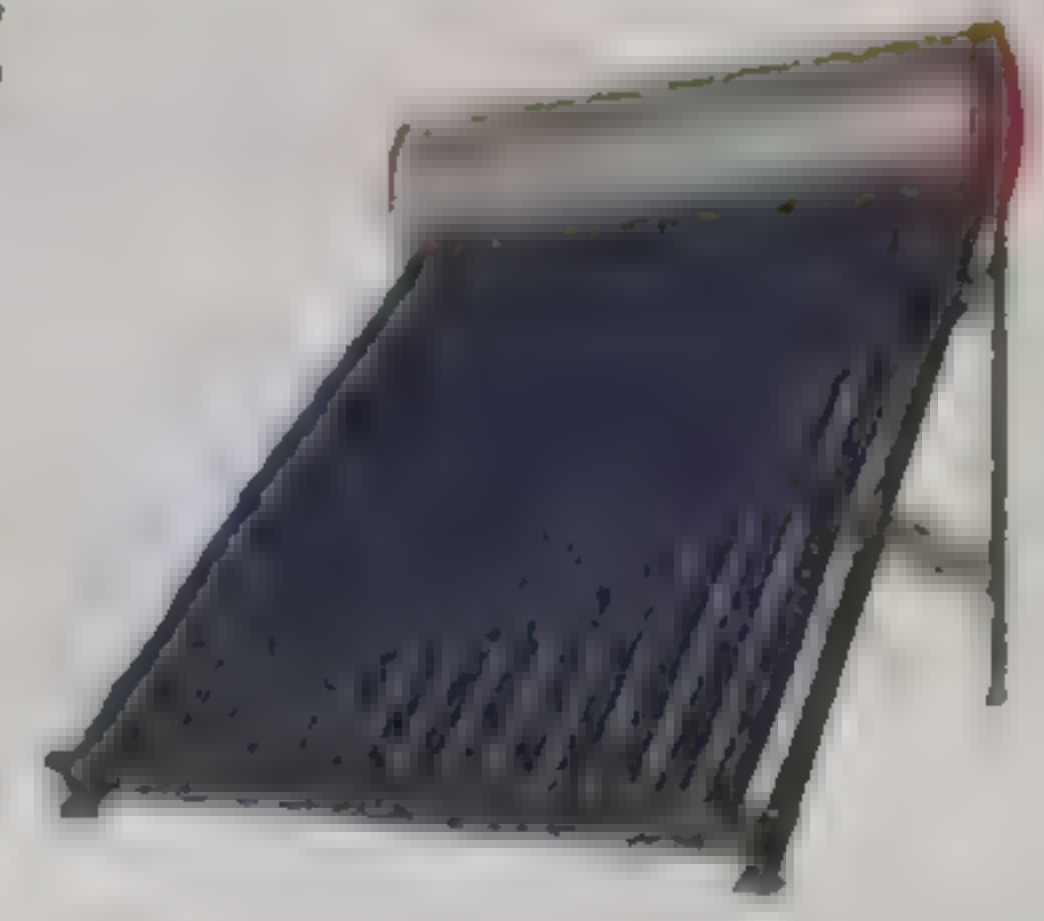


2 The opposite figure represents a panel of black pipes:

a. The input energy is _____

b. The output energy is _____

c. It is placed at _____



What happens if?

1 Wind moves the blades of windmills?

2 Wind doesn't blow in an area that contains wind turbines?

Give reasons for:

1 Solar energy is a renewable resource of energy.

2 People used windmills and watermills 400 years ago.

3 People now use modern wind turbines.

4 People depend on different machines in their lives.

5 You feel the warmth of the Sun at night.

6 Greenhouses are very important to farmers.

Lesson 2

Activity Solar Energy

Put (✓) or (X):

- 1 Energy received from the Sun is called solar energy.
- 2 Even at night, we can feel the warmth of the Sun's energy.

Solar Panels

Importance:

- Most solar panels are used to generate electricity.

معظم الألواح الشمسية لتوليد الكهرباء.

Structure:

- It consists of a large number of small solar cells.

يتكون من العديد من الخلايا الشمسية الصغيرة.

How do they work?

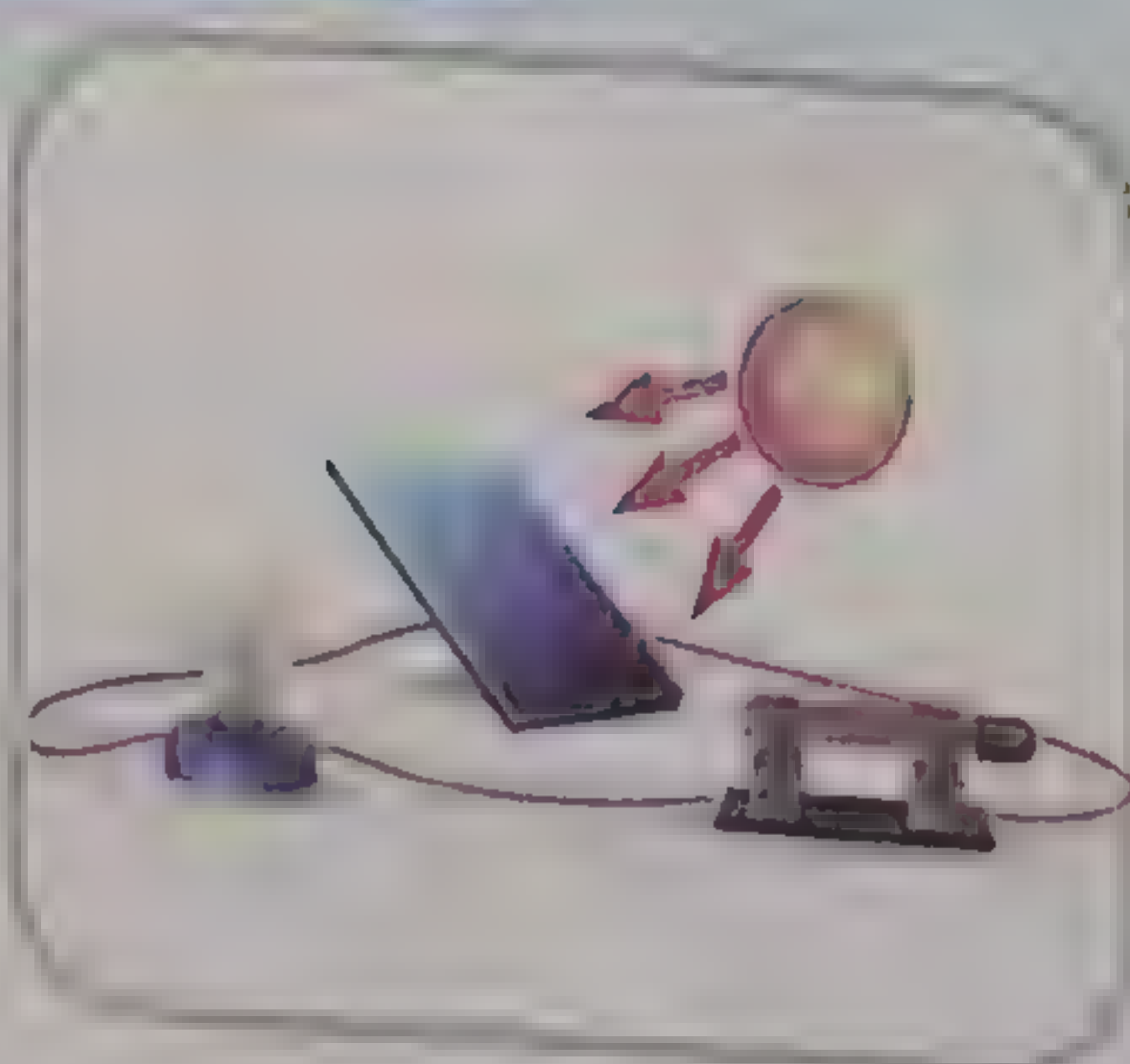
- Solar cells catch the radiant energy coming from the Sun and turn it directly into electricity.

تلتقط الخلايا الشمسية الطاقة الإشعاعية للشمس وتحوّلها مباشرة إلى كهرباء.

Solar panels can be

Very Small

- To supply only one light bulb with energy.



Very Large

- To supply buildings or cities with energy.



Uses of electricity generated by solar panels

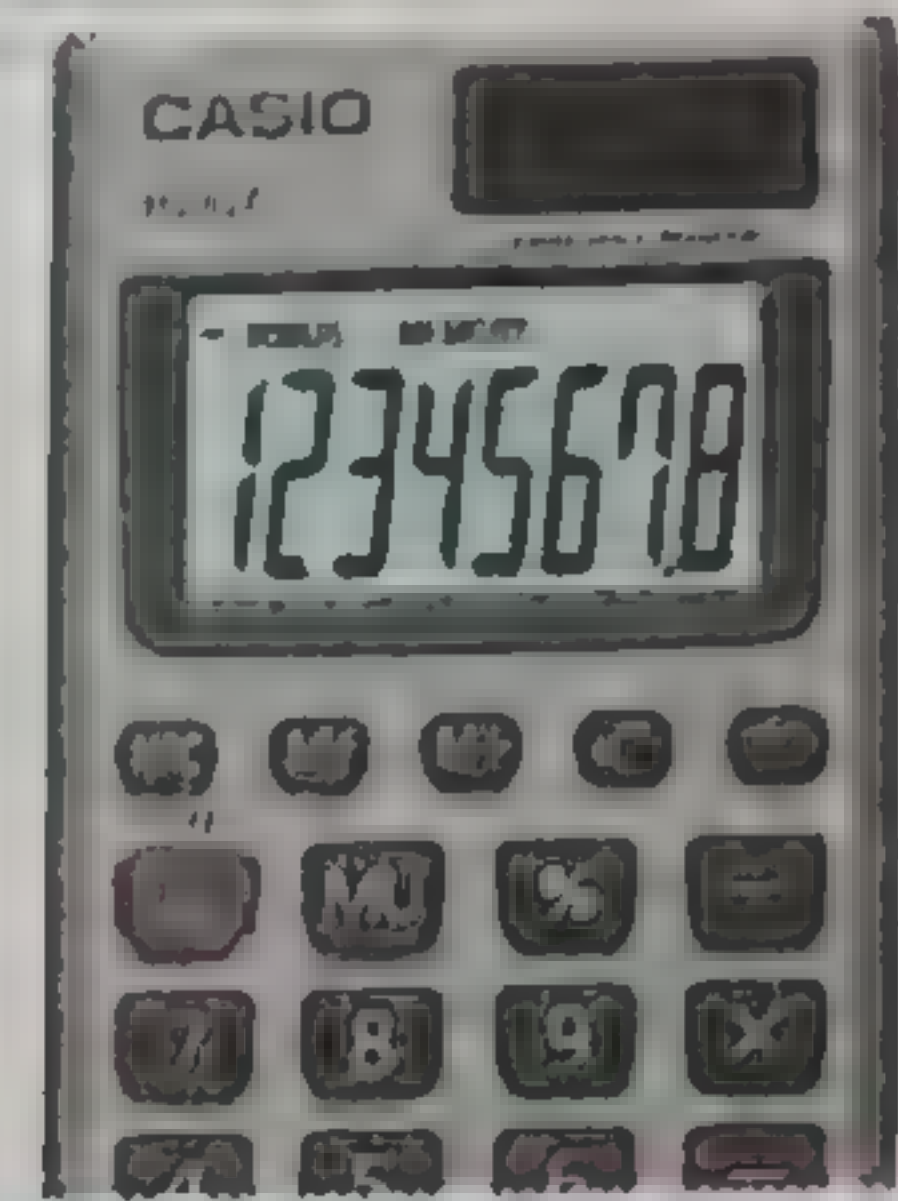
1 It can be used directly to light streets.



2 It can be used to operate electric devices.



3 It can be used to recharge some types of batteries, like solar-cell calculators.



4 It can be used to power irrigation equipment in some villages.



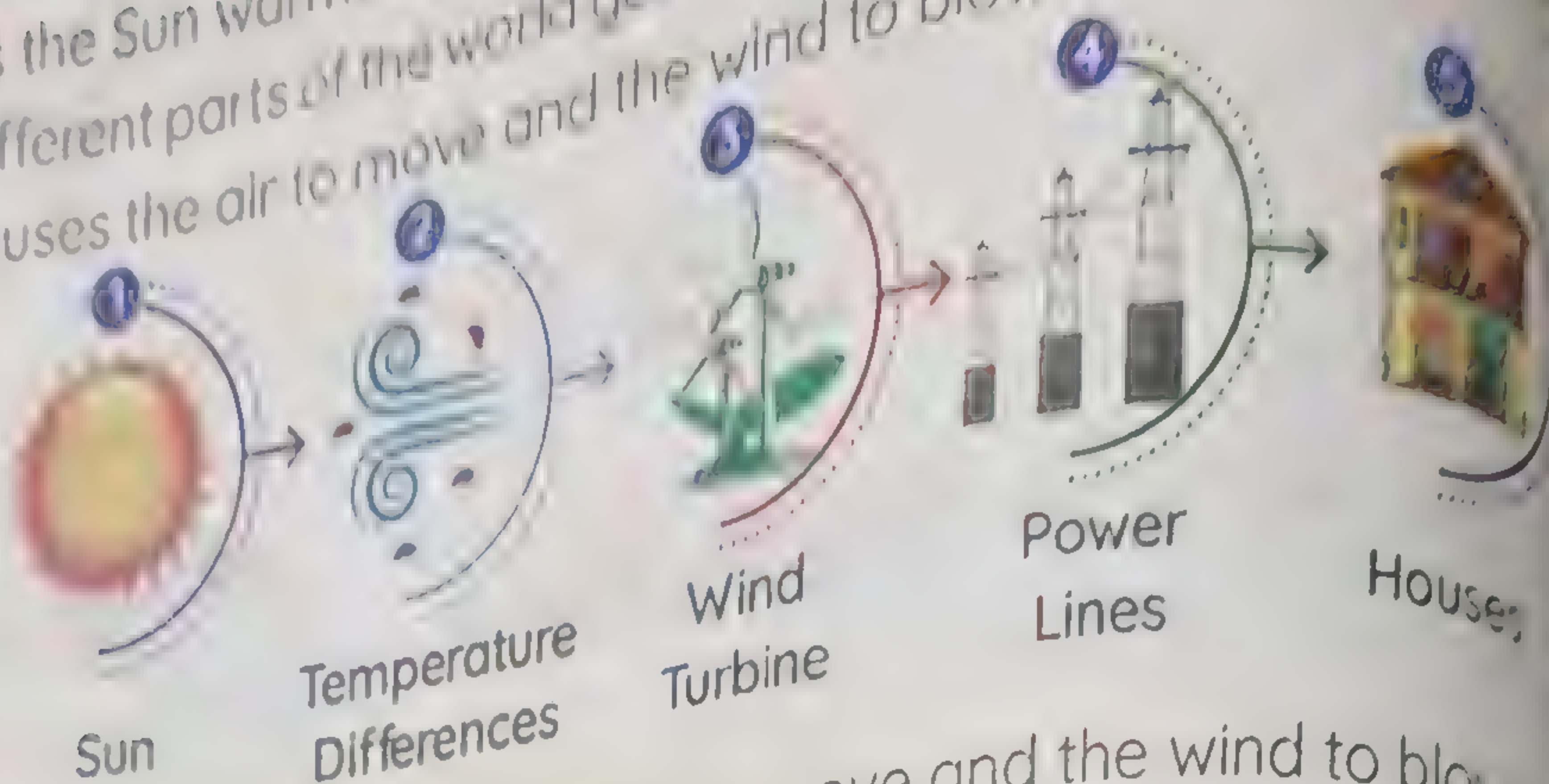
Check your understanding?

Put (✓) or (X):

- 1 The electrical energy is considered the input energy of solar panels. ()
- 2 Some calculators run on batteries powered by small solar cells. ()
- 3 Houses may use electricity produced from rooftop solar panels. ()
- 4 Small panels can supply energy to whole buildings. ()

Activity 5

- As the Sun warms Earth, it warms the air.
- Different parts of the world get different amounts of solar energy, which causes the air to move and the wind to blow.



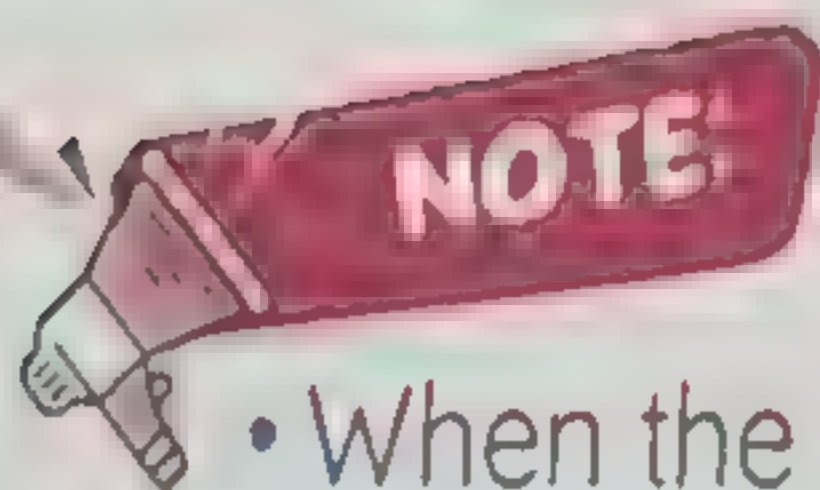
- Solar energy** causes the air to move and the wind to blow.
- The kinetic energy of **wind** rotates the blades of **wind turbine** that are used to spin generators.
- Generators** change kinetic energy into electrical energy.
- Electricity** is transferred through big wires towards cities to light houses and streets.

تسبب الطاقة الشمسية في حركة الهواء وهبوب الرياح.

تقوم الرياح بتدوير شفرات التوربينات الهوائية التي تقوم بدورها بتشغيل المولدات.

يقوم المولد بتحويل الطاقة الحركية إلى طاقة كهربائية.

تنتقل الكهرباء عن طريق أسلاك ضخمة إلى المدن لإضاءة المنازل والشوارع.



- When the kinetic energy of the wind increases, the blades rotate faster.



Check your understanding?

Put (✓) or (X):

- Kinetic energy of the wind can be used to generate electricity. (✓)
- Generators can be used to spin wind turbines. (X)

Exercises on Lesson 2

Choose the correct answer:

- 1 Solar panels can be used to operate all the following, except _____.
a. a calculator b. gas oven
c. irrigation equipments d. street lights
- 2 The _____ energy of the Sun causes air movements and wind blowing.
a. chemical b. radiant c. electrical d. sound
- 3 The difference in temperature between cold and hot air causes _____.
a. rain b. a shadow c. wind blowing d. a rainbow
- 4 _____ change the kinetic energy of turbines into electrical energy.
a. Motors b. Panels c. Generators d. Fans
- 5 The correct arrangement for generating electricity from wind energy is: _____.
a. Sun – wind – power lines – wind turbines - houses
b. Sun – wind – wind turbines – power lines - houses
c. Sun – wind turbines – power lines – wind - houses
d. Sun – wind turbines – wind – power lines - houses
- 6 Which statement is true?
a. The wind rotates the blades of watermills.
b. Electricity is transferred to cities through wind.
c. Solar energy causes the wind to blow.
d. Generators are used to spin turbines.
- 7 The electricity from wind turbines is transmitted into houses and factories through _____.
a. the wind b. solar panels c. generators d. wires

Put (✓) or (✗):

- 1 A solar cell consists of a large number of small solar panels. ()
- 2 A calculator's output energy is solar energy. ()

Energy and Fuel

- 3 Solar cells are designed to capture the radiant energy of the Sun.
- 4 Small solar panels may be able to light buildings.
- 5 When the kinetic energy of the wind increases, the wind turbine blades spin more quickly.
- 6 Generating electricity by wind turbines depends on the kinetic energy of water.
- 7 Wind energy is a clean source of energy.
- 8 Wind turbines are placed in windy areas.

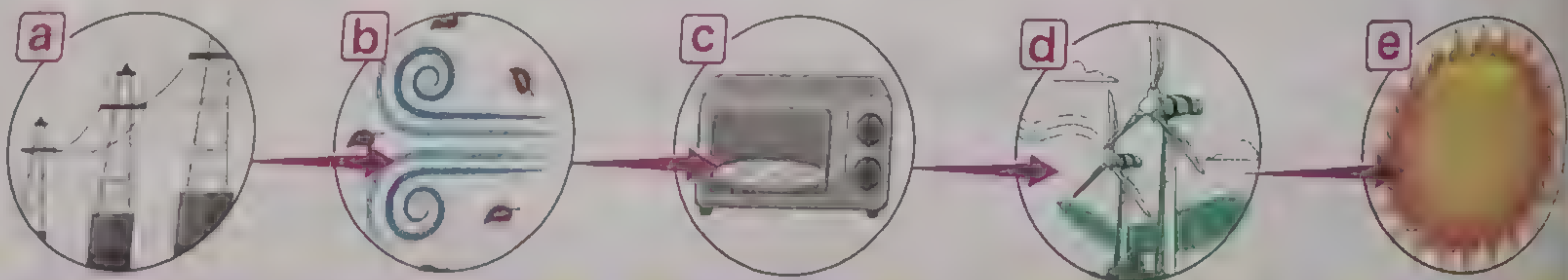
3 Write the scientific term:

- 1 A device that the wind rotates its blades for generating electricity. (.....)
- 2 It produces radiant energy that causes the wind to blow. (.....)
- 3 The device in an electric power station that turns kinetic energy into electrical energy. (.....)

4 Complete the following sentences:

- 1 The Sun the Earth and the air.
- 2 Solar energy causes the air to and the wind to
- 3 The generator converts energy into energy.
- 4 Electricity is transferred to cities through
- 5 In some villages, solar panels are used to generate energy that is used to operate

5 To generate electricity, arrange the following figures from start to end:



What happens if?

- 1 The wind rotates the blades of the turbine?

- 2 The kinetic energy that is applied on the wind turbines increases?

Give reasons for:

- 1 The Sun helps in blowing the winds.

- 2 Generators have an important role in a power plant.

Lesson

3



Activity 6 Falling Water

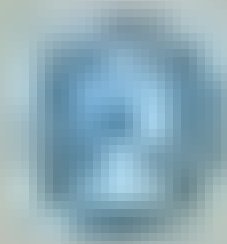
» As rivers run downhill, they change gravitational potential energy into kinetic energy.



Dams are built on rivers?

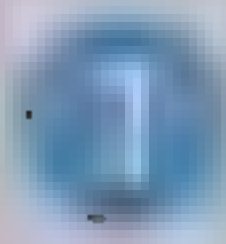


To control the flow of water.

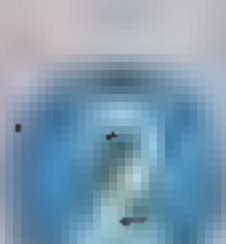


To increase potential energy of water.

How can water be used to generate electricity?



A hydroelectric dam holds back the flow of water to increase its potential energy.



When the water is released, it passes through the blades of turbines, so they rotate.



Turbines operate generators, so kinetic energy is converted into electrical energy.



Electricity is transferred to cities through long electric wires.

يقوم السد بإيقاف سريان المياه؛ مما يؤدي لزيادة طاقة وضع المياه. 2 عند تحرير المياه، تسقط المياه على شفرات التوربينات؛ مما يؤدي لدورانها. تقوم التوربينات بتشغيل المولدات؛ فتتحوّل الطاقة الحركية إلى طاقة كهربائية. 4 تنتقل الكهرباء إلى المدن عبر أسلاك كهربائية طويلة.

Hydroelectricity: (Hydroelectric energy)

• It is a type of electrical energy generated by water turbines in dams.

الطاقة الكهربائية المائية: هي نوع من الطاقة الكهربائية تُولَّدُها التوربينات المائية في السدود.

Concept

» The following table explains the similarities and differences between wind turbines and water turbines:

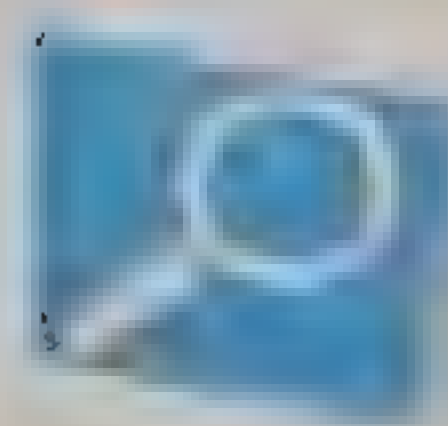


P.O.C	Wind Turbines	Water Turbines
Differences	They are used in windy places.	They are used in places where dams are built on rivers.
Similarities	<ol style="list-style-type: none"> Both of them depend on renewable resources. Both of them use kinetic energy to turn turbines. Both of them are used to generate electricity. 	

Check your understanding?

» Put (✓) or (X):

- The electricity produced by water is known as electromagnetic energy. ()
- Dams are built in places with a strong wind. ()
- Wind turbines and water turbines are renewable energy resources. ()
- As the kinetic energy of the water increases, the blades rotate faster. ()



Activity

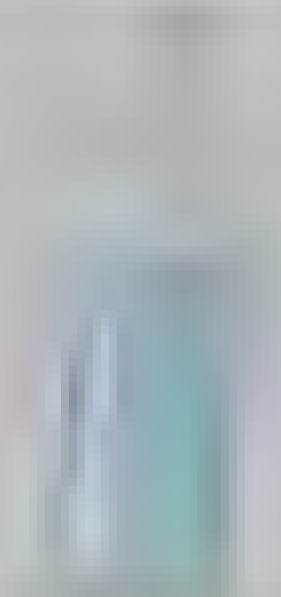



Hands-on Investigation:
Modeling a Turbine Generator

In this activity, we will design a model of a water turbine.

Experiment



Tools

Water bottle	Pinwheel	Plastic cup	Large jug
			

Steps:

- 1 Use the following materials to design a model of a water turbine.
- 2 Pour the water from the bottle onto the blades of the pinwheel.
- 3 When the water bottle runs out, use a plastic cup to refill it with the water in the jug to pour the water over the blades again.

Observation:

- » The blades rotate when water is poured over them.
- » The blades stop when the water completely runs out.

Conclusion

- » Moving water has **kinetic energy** that is used to run water turbines to generate **hydroelectricity**.



Water Cycle

The river's water does not return to its source, but it flows into other bodies of water.

Water **evaporates** and then **condenses** into clouds.

When rain falls from these clouds, the water returns to the river.



• لا تعود مياه النهر إلى منبعها، ولكن يتدفق الماء إلى المسطحات المائية الأخرى.

• يتبخر الماء ويتكثف بعد ذلك في شكل سُحُب.

• عندما يسقط المطر من هذه السُحُب يعود الماء مرة أخرى إلى النهر.

Check your understanding?

Put (✓) or (X):

- 1 Water is a renewable resource of energy. ()
- 2 In the water cycle, water condensates and then evaporates. ()
- 3 The blades of water turbines rotate by kinetic energy of wind. ()
- 4 Wind turbines can be used to generate hydroelectricity. ()

Lesson

4



Activity 8

Record Evidence Like a Scientist
Windmills and Watermills

» In this concept, you have learned a lot about renewable and nonrenewable energy resources and the benefits of using renewable energy resources.

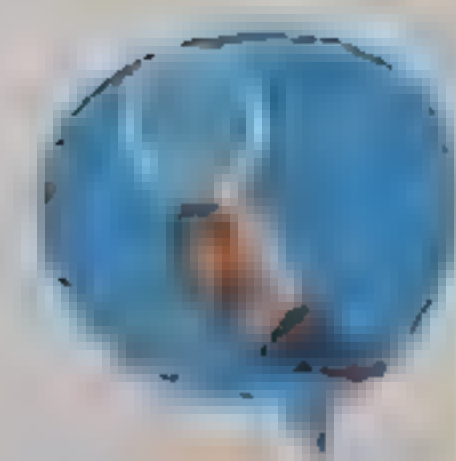


Question:

» What are the different ways to use renewable energy resources to generate electricity?



My Claim:



Evidence:



Scientific Explanation with Reasoning:



5 The electricity produced by water is known as electromagnetic energy.

6 When water falls down on water falls, its kinetic energy decreases.

3 Write the scientific term:

1 The device in an electric power station that turns kinetic energy into electrical energy. ()

2 A structure on the river that controls the flow of water and increases the potential energy of water. ()

3 A type of electrical energy generated by water turbines in dams. ()

4 Complete the following using the words between the brackets

(condenses - Wind turbines - evaporates - kinetic energy - water turbines - wires)

1 The input energy of a generator is .

2 are placed in windy areas, where are found on rivers.

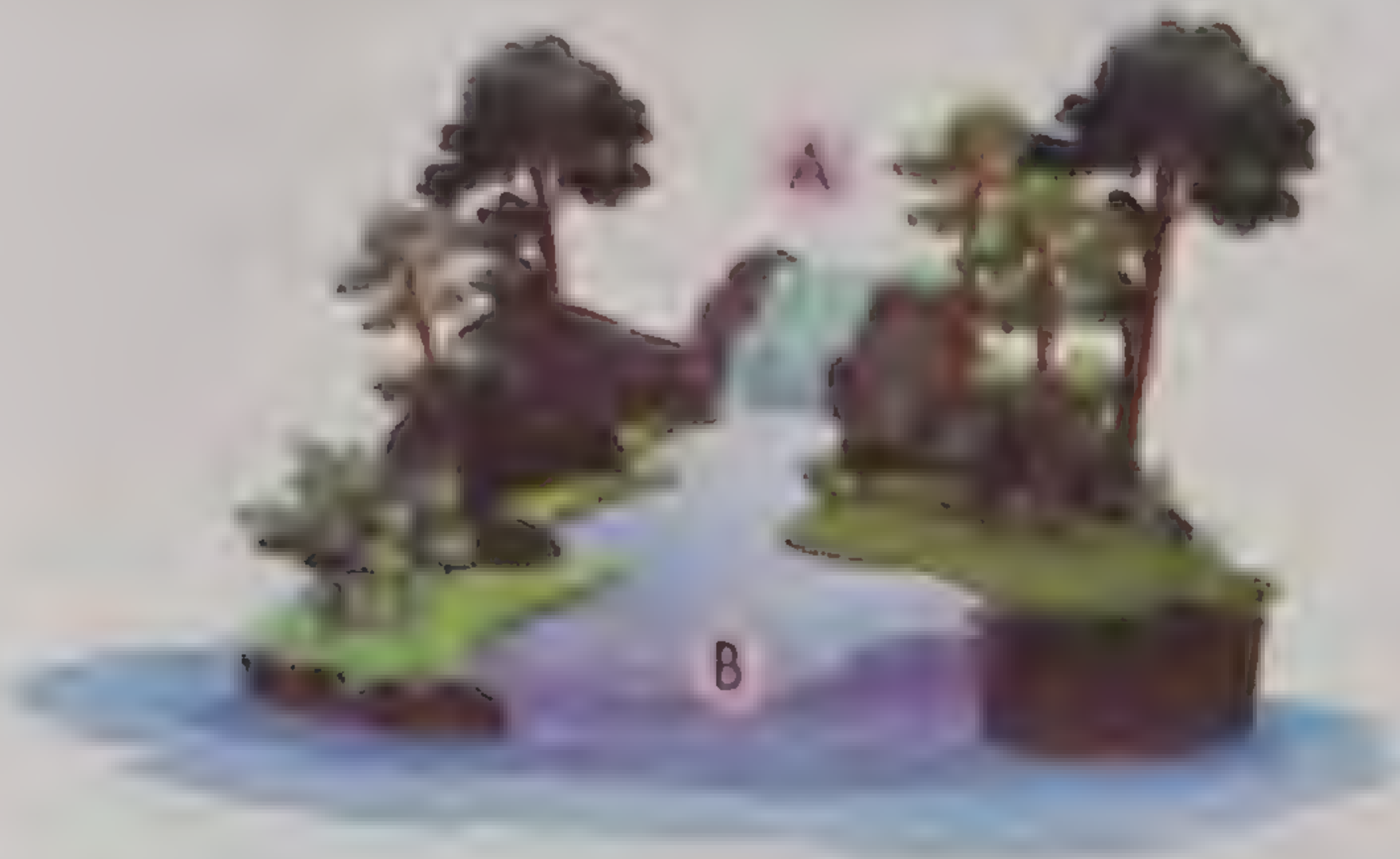
3 Electricity is transferred to cities through to light cities.

4 In water cycle, water by the heat of the Sun, then before falling as rain.

5 Complete the following table:

P.O.C	Wind Turbines	Water Turbines
Location		
Similarities		

Study the following figures, then answer the questions below:
The following figure represents a waterfall.



a. The potential energy is maximum at point _____.
b. When the water falls, _____ energy is converted into _____ energy.

c. This figure represents _____.
b. It controls the flow of water, when it increases the _____ energy of water.
c. When water falls on turbines, they rotate to make _____ run and generate _____.



What happens if?

1. Dams hold back the flow of water?

2. The water of dams becomes free?

Give a reason for:

Dams are built on rivers.

Model Exams

on Concepts

Model Exam 1

Question 1

(A) Choose the correct answer:

1. All the following are considered renewable resources of energy.
a. wind b. coal c. the Sun
d. water
2. Modern turbines are _____ than old windmills.
a. longer b. shorter c. heavier
d. slower
3. The power source for the electric fan is _____.
a. wind b. water c. heat
d. electric
4. Hydroelectric power is produced using _____.
a. air b. water c. soil
d. plants

(B) Write the scientific term:

A structure on the river that controls the flow of water and increases potential energy of water.

Question 2

(A) Put (✓) or (X):

1. A solar cell consists of a large number of small solar panels.
2. Both modern wind turbines and old windmills are used to generate electricity.
3. When the kinetic energy of the wind increases, the windmill blades spin faster.
4. Windmills can do their job all the time, as the wind never stops blowing.

(B) Give a reason for: You feel the warmth of the Sun at night.

Question 3

The opposite figure represents a panel of black pipes:

1. The input energy is _____.
2. The output energy is _____.
3. It is placed at _____.

Model Exam 2

Question 1

(A) Choose the correct answer:

- 1 Both modern wind turbines and old windmills are similar in their _____.
a. blades number b. height c. ways of working d. blades shape
- 2 The electricity from wind turbines is transmitted into houses and factories through _____.
a. the wind b. devices c. generators d. wires
- 3 The difference in temperature between cold and hot air causes _____.
a. rain b. a shadow c. wind blowing d. a rainbow
- 4 Dams control the water flow and increase its _____ energy.
a. potential b. electric c. magnetic d. thermal

(B) Write the scientific term:

A device that consists of black pipes used to heat water. (_____)

Question 2

(A) Put (✓) or (X):

- 1 The electricity produced by water is known as electromagnetic energy. ()
- 2 Solar panels can be used in irrigation equipment. ()
- 3 Sun is responsible for the water cycle. ()
- 4 We use solar energy to preserve food. ()

(B) What happens if?

Wind doesn't blow in an area that contains wind turbines?

Question 3

Choose from column (A) what suits it in column (B):

(A)	(B)
1 Greenhouses	a. are used in heating water.
2 Concave mirrors	b. are used in planting some kinds of crops.
3 Panels of black pipes	c. are used in cooking food.

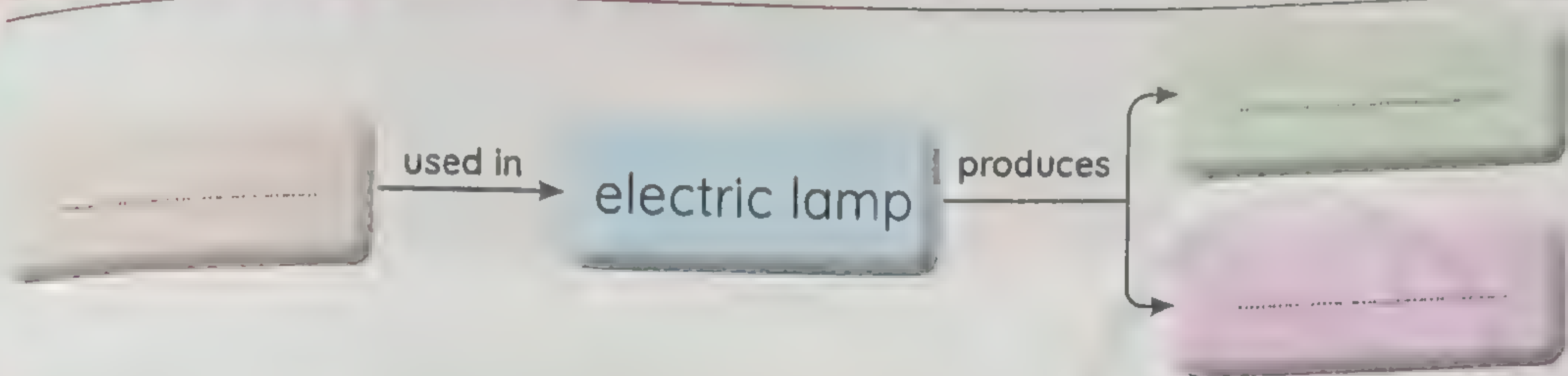
1 Choose the correct answer:

- 1 Energy doesn't destroy nor create from nothing; this indicates
 - a. the draining of energy resources
 - b. the conservation and transformation of energy
 - c. resources of energy are numerous
 - d. destroying the energy resources
- 2 The energy produced by radio that reflects its main function is
 - a. electric energy
 - b. sound energy
 - c. light energy
 - d. chemical energy
- 3 The design and work of the robot that explores the surface of Mars depend on the idea of transforming
 - a. electric into kinetic energy
 - b. potential into kinetic energy
 - c. light into electric energy
 - d. kinetic into electric energy
- 4 In our daily lives, we use devices that depend on energy. Which of the following uses is true?
 - a. A computer depends on kinetic and electric energy.
 - b. A ceiling fan depends on electric energy.
 - c. The function of television depends on hydroelectric energy.
 - d. Cell phones depend on potential and kinetic energy for operation.
- 5 Which of the following energy forms isn't produced from the Sun?
 - a. Thermal energy
 - b. Light energy
 - c. Kinetic energy
 - d. Radiation energy
- 6 Which of the following is a preferred natural resource to generate clean energy?
 - a. Ocean and river water
 - b. Trees and dry herbs
 - c. Water, coal, and oil
 - d. Wind, oil, and natural gas
- 7 are used in converting light energy to electric energy.
 - a. Wind turbines
 - b. Water turbines
 - c. Solar panels
 - d. Windmills
- 8 is a renewable source of energy.
 - a. Coal
 - b. Natural gases
 - c. Water
 - d. Fossil fuel
- 9 Energy produced from flowing water from waterfalls and dams on turbines is called energy.
 - a. mechanical
 - b. hydroelectric
 - c. potential
 - d. thermal

2 Rearrange the following steps to describe how coal is formed:

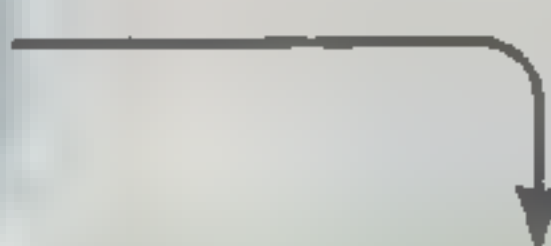
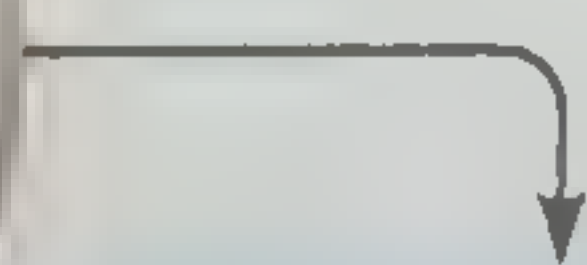
- () The Earth's surface plants get old and die
- () The remains of the plants were decomposed and covered with sand and clay layers.
- () Anciently, Earth was containing with swamps where plants grew.
- () Several layers of clay and sand were deposited on the remains of died plants.
- () The buried plants were changed into coal due to the effects of heat and pressure.

3 Complete the following model:

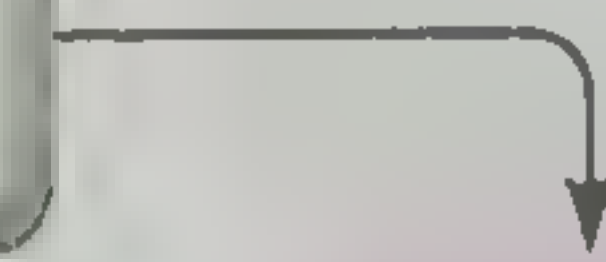


4 Complete the following model to describe the hydroelectric energy, then determine the inputs and outputs of this system.

Potential energy of the waterfalls



Kinetic energy



- Inputs: _____

- Outputs: _____

Theme

4

Change and
Stability



Unit
4

Shifting Surfaces

Unit Concepts:

Concept

1

Breaking Down and Moving Rocks

Concept

2

Changing Landscapes

Unit Project:

Forces that Shape the Earth

Unit Objective

In this unit, we will

- 1 Factors that shape the Earth's surface, such as weathering, erosion, and deposition, occur over time.
- 2 The role of wind and water in changing the Earth's surface.

Get Started

What I Already Know



How the Earth's surface changes



» The Earth's surface is always changing.

Many factors can break down or change the Earth's surface, such as:

1 Weathering

2 Erosion

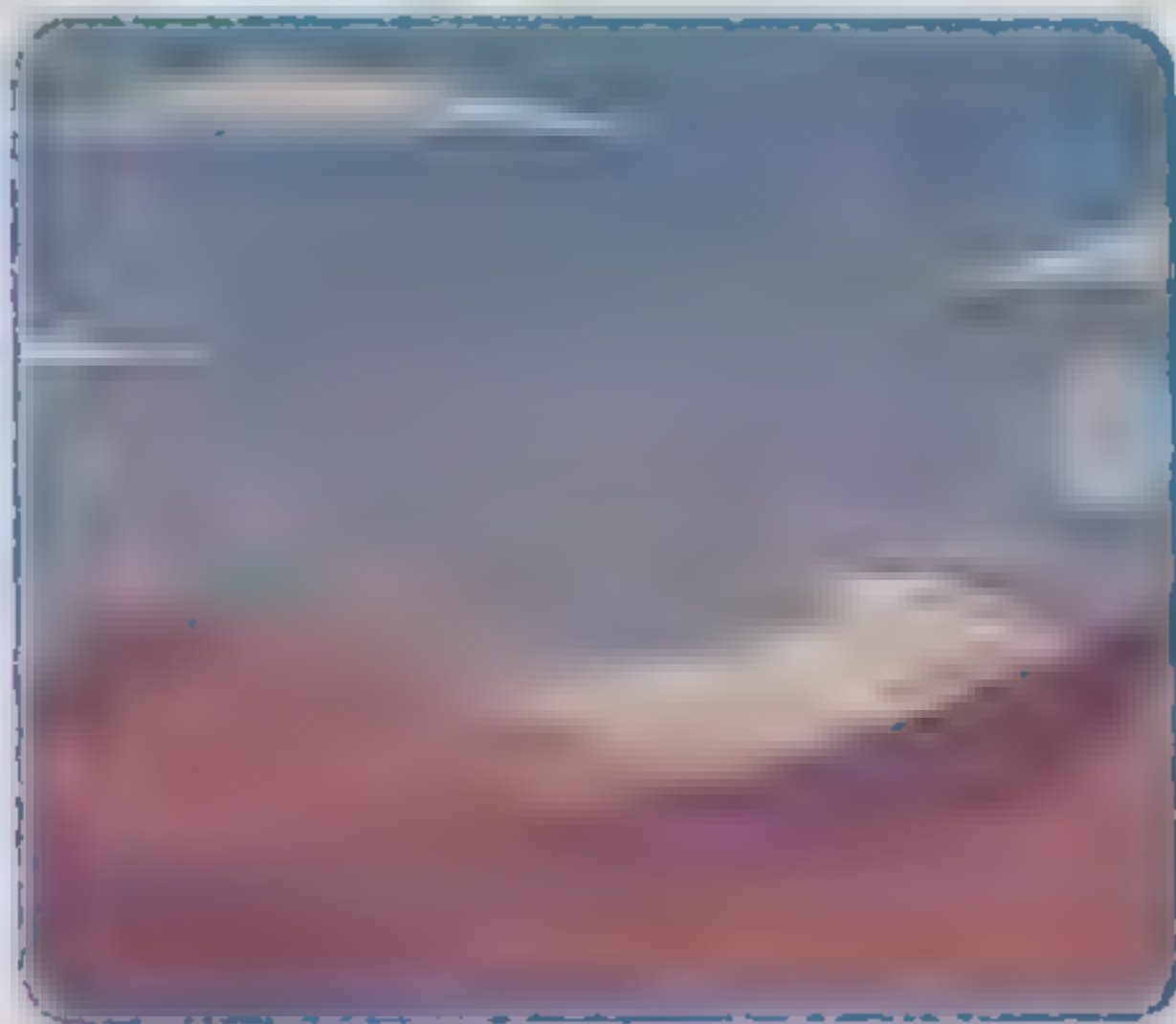
3 Deposition

» Many of Earth's landforms take millions of years to form, and we are going to study the story of each one.

Canyon



Sand Dunes



Valley



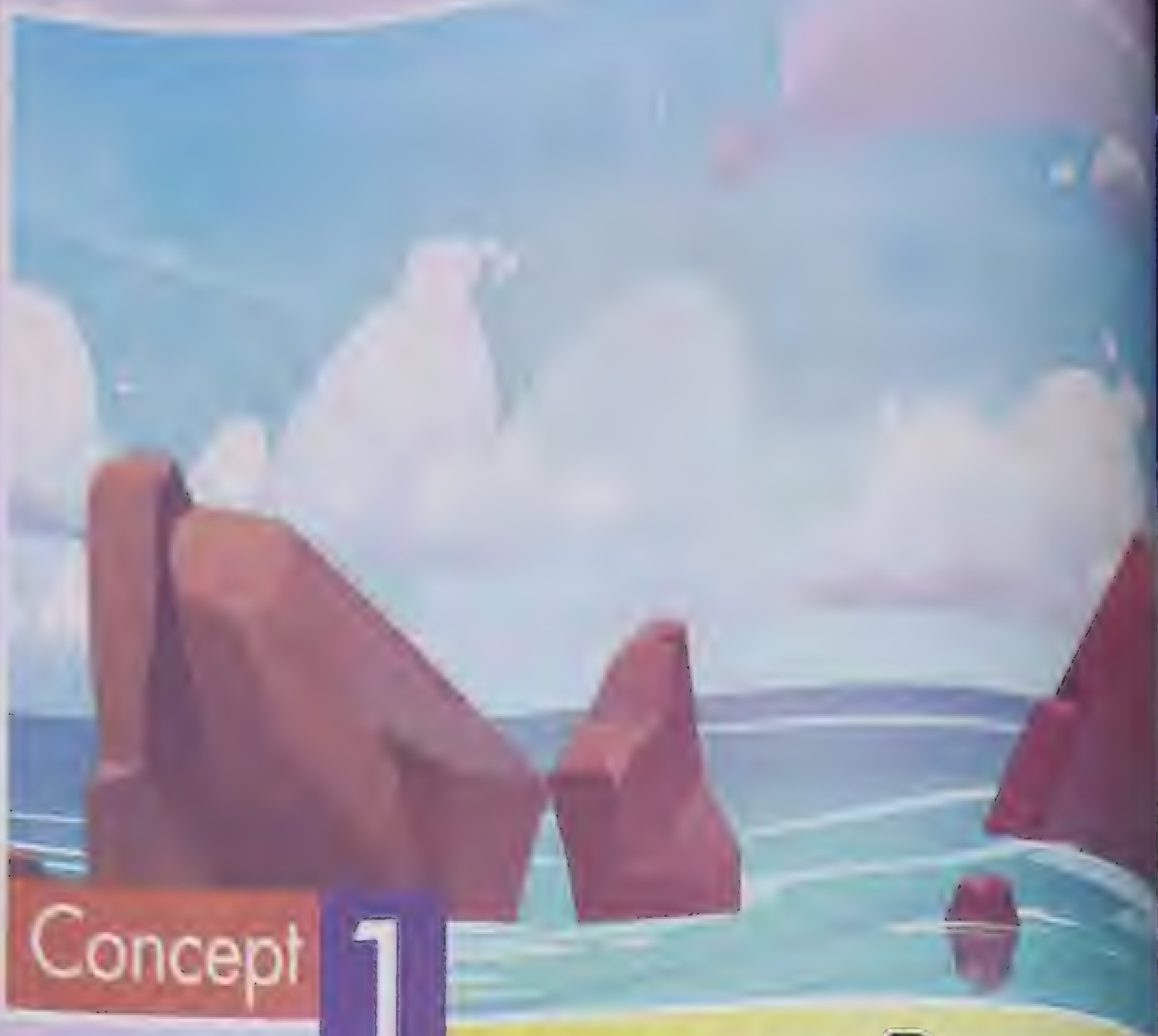
Delta



Wadi Nakhr:

- The image shown is of a canyon called **Wadi Nakhr** in the country of Oman. Have you ever seen a canyon?
- In your opinion, what could cause the different landforms shown in the photo?
- The wavy cliff sides and high peaks are clues to help us understand how this canyon was formed.





Concept

1

Breaking Down and Moving Rocks

Concept Objectives:

By the end of this concept:

- ▶ Students can construct explanations based on observations of the roles water, wind, and heat play in weathering, erosion, and deposition.
- ▶ Students can make observations and collect data to provide evidence that mechanical and chemical weathering cause changes on Earth's surface over time, even in systems that appear to be stable.

Key Vocabulary

- Air
- Water
- Weathering
- Chemical weathering
- Mechanical weathering
- Deposition
- Erosion
- Heat
- Sediment
- Soil

Concept 1

Breaking Down and Moving Rocks

Lesson 1

- Activity 1 Can You Explain?
- Activity 2 Describing Sediments
- Activity 3 Sediments, Rocks, and Changes

Lesson 2

- Activity 4 What Do You Already Know About Breaking Down and Moving Rocks?
- Activity 5 What Is Weathering?
- Activity 6 Types of Weathering

Lesson 3

- Activity 7 Hands-on Investigation: Modeling Mechanical and Chemical Weathering
- Activity 8 Weathering

Lesson 4

- Activity 9 Erosion
- Activity 10 Deposition

Lesson 5

- Activity 11 Evidence of Change
- Activity 12 Record Evidence Like a Scientist: Disappearing Sandcastles

Lesson

1



Activity 1 Can You Explain?

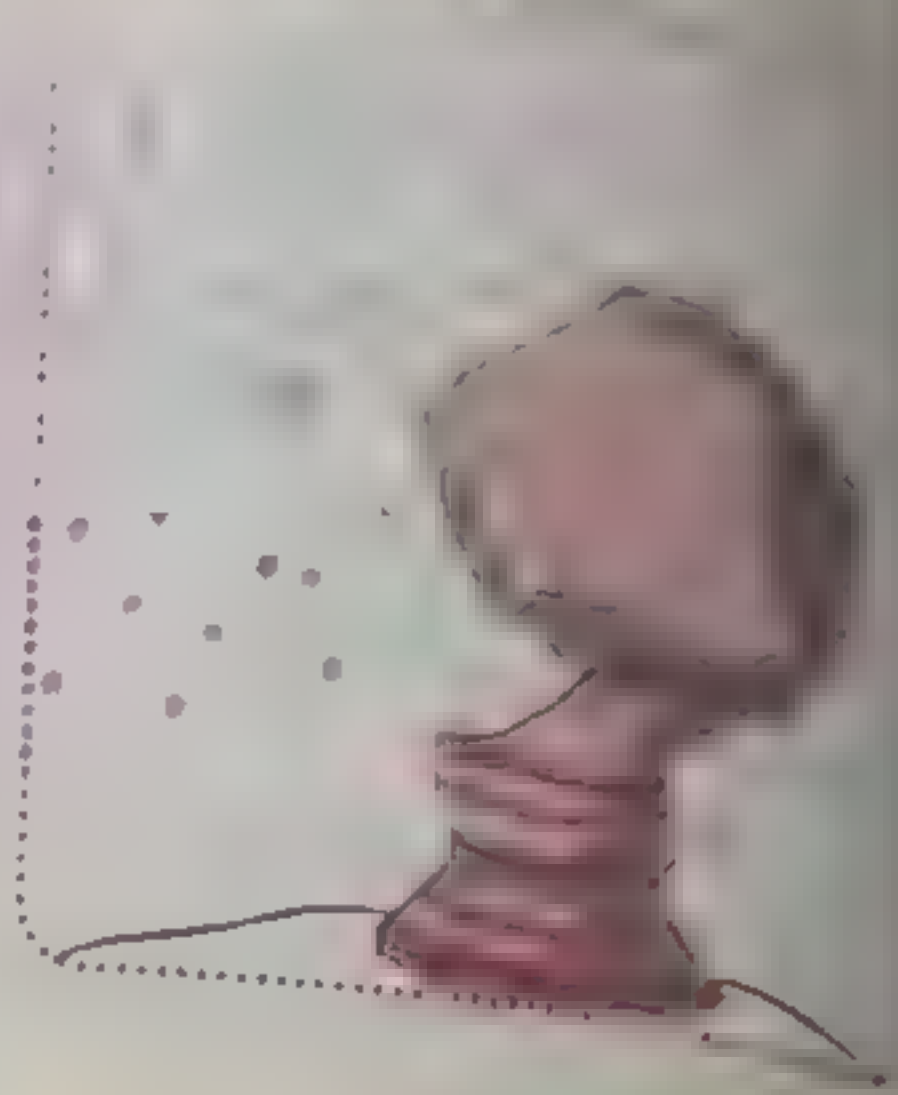
- » The Earth's surface is always **changing** due to the effects of **wind, water, and weather changes**.

سطح الأرض باستمرار؛ بسبب العديد من العوامل مثل: الرياح، والماء، وعوامل الطقس.

For Example:

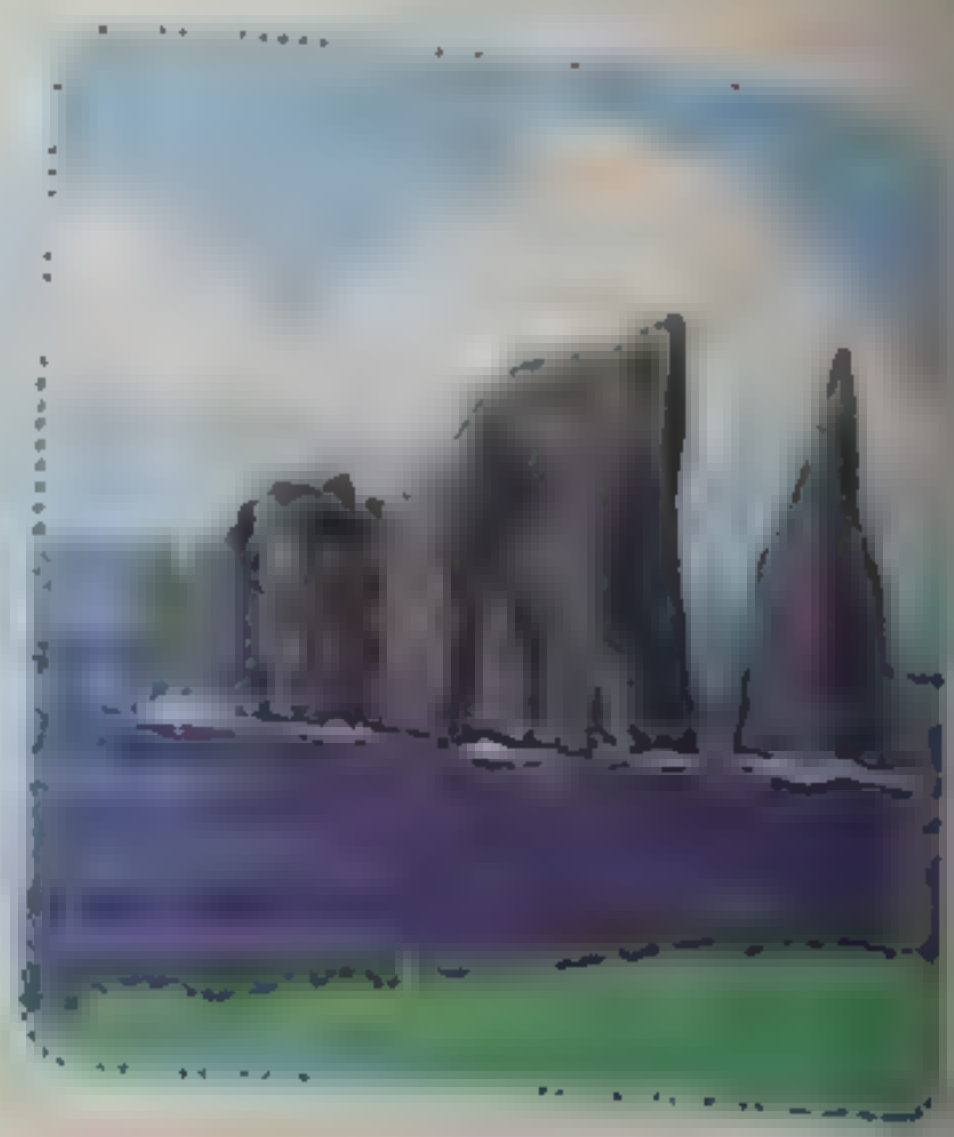
- 1 **Wind** can break down rocks and move small particles of rocks from one place to another.

• يمكن للرياح أن تُفكّ الصخور وتنقل جزيئات الصخور الصغيرة من مكان إلى آخر.



- 2 **Water** can break down rocks and change the shapes of rocks.

• يمكن للمياه أن تُسبّب تفتت الصخور وتغيير شكلها.



Check your understanding?

- » Correct the underlined words:

1 The Earth's surface is stable as time passes. ()

2 Wind and water can change the moon's surface. ()

- » Give a reason for:

○ The Earth's surface is always changing.

Activity 2 Disappearing Sandcastles

Concept 1

If you walked on the sand of the beach dunes, would your footprints remain the next day?

Yes

No



If you built a small sandcastle on the beach, do you think it would still be there the next day?

Yes

No



Examples of Erosion

Sandcastles Erosion:

- 1 Water waves break sandcastles down after few hours.
- 2 Water waves can move sand particles to other places.



Beach Erosion:

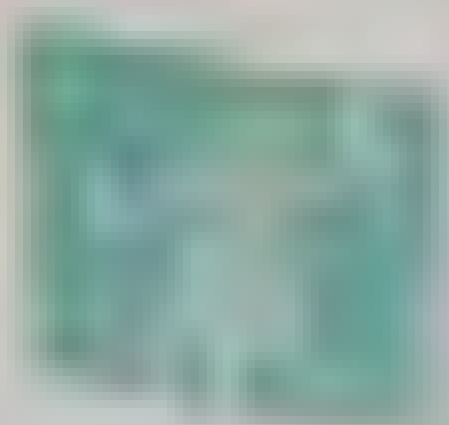
- The movement of the waves causes erosion of the beach over time.



NOTES

- Sand particles are formed from the breaking down of rocks.
- Wind and water can transport sand particles from one place to another.

• تتكوّن جزيئات الرمل من تفتت الصخور. • يمكن للرياح والماء نقل جزيئات الرمل من مكان إلى آخر.



Activity

Sandcastles, Rocks, and Canyons

We have learned that wind, water, and weather changes can change the Earth's surface.

Earth's surface is changing by two ways:

Fast Changes

Some changes to the Earth's surface happen so quickly, such as:

- The disappearing of sandcastle after few minutes when water waves hit it.



بعض التغيرات لسطح الأرض تحدث بصورة سريعة مثل اختفاء القلعة الرملية بعد دقائق من اصطدام الأمواج بها.

Slow Changes

Some changes to the Earth's surface happen very slowly, such as:

- A little change may happen in the shape of coastal rock after many years because some parts of the rock break off.



بعض التغيرات لسطح الأرض تحدث بصورة بطيئة جدًا مثل تغير ببطء في شكل الصخور الساحلية؛ بسبب تكسير بعض الأجزاء في صخور.

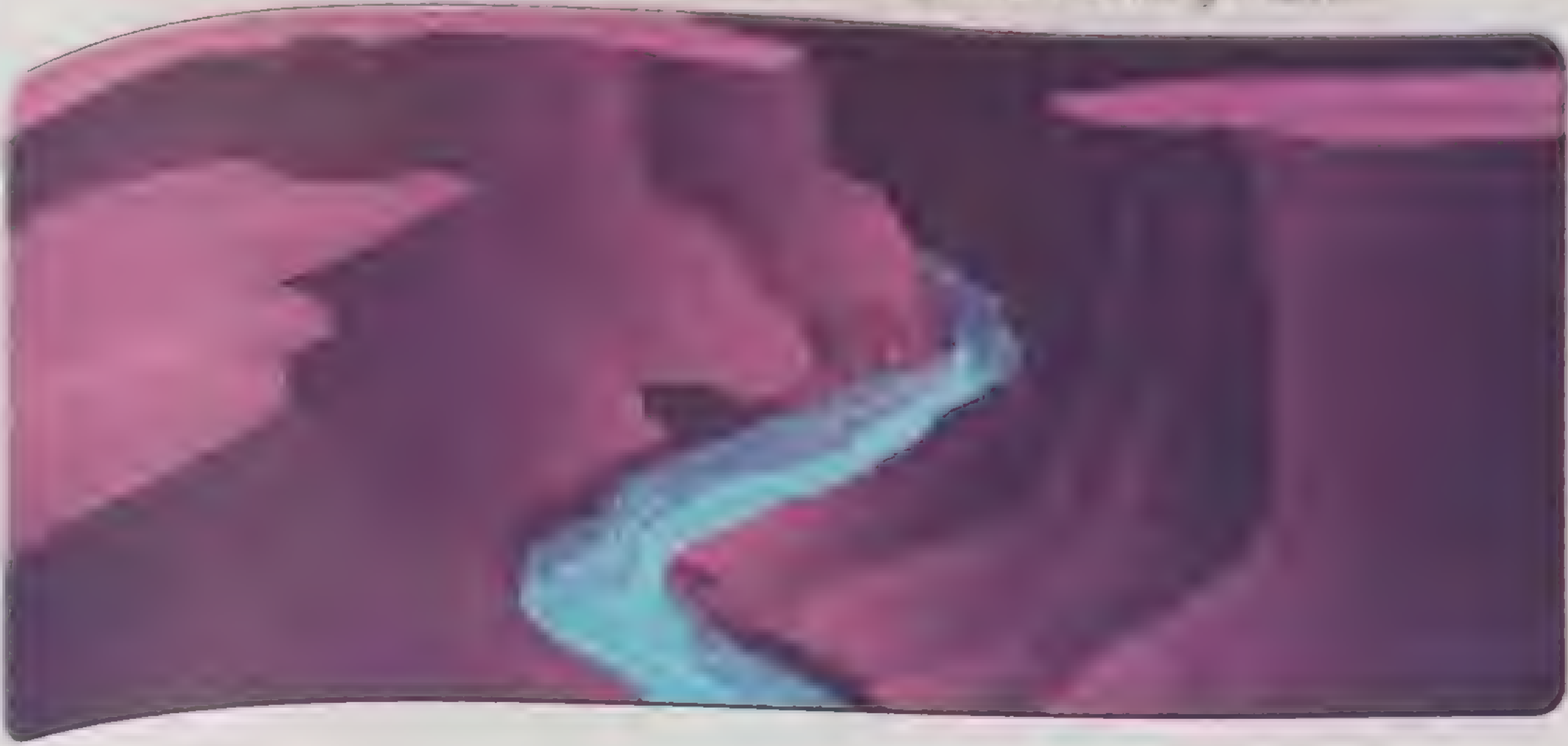
Similarities between sandcastles and coastal rocks:

- Both have steep needle-like parts and sloping sides at the bottom.
- They are formed by the effect of water and wind.

التشابه بين القلاع الرملية والصخور الساحلية:
يحتوي كلاهما على أجزاء حادة تشبه الإبر وجوانب مائلة في الأسفل.
بشكلان بفعل الماء والرياح.

Canyons

They are deep valleys carved by the flowing water.



Concept 11

shape:

The canyon has steep needle-like parts and slopes at the sides.

Time of Formation:

The canyon takes many years to be formed.

Way of Formation:

The canyon is formed by the effect of water.

• الشكّل: يحتوي كلامنا على أجزاء حادة تشبه الإبر ومنحدرات على الجانبين.

• الوقت اللازم لتكوّنه: يستغرق تكوين الأخدود العديد من السنين.

• طريقته تكوّنه: يتشكل الأخدود بفعل المياه.

Check your understanding?

Put (✓) or (X):

- 1 Canyons have slopes at the bottom and steep needle-like parts. ()
- 2 Sandcastle becomes less stable after collision with the water waves. ()
- 3 The shape of the canyon was formed in a very short time. ()
- 4 Canyons are carved by the flowing water. ()

Exercises on Lesson 1

1 Choose the correct answer:

1. _____ can change the features of the Earth's surface.
a. Water b. Wind c. Weather d. All the previous
2. All the following are landscapes that have changed over a long time except _____.
a. canyons b. sandcastles c. coastal rocks d. mountains
3. Which of the following shapes may disappear quickly?
a. Canyons b. Footprints on sand
c. Coastal rocks on the beach d. Mountains
4. Sandcastles may be wrecked by the force of _____.
a. water b. wind c. gravity d. a and b
5. Sandcastles will _____ after one year.
a. still the same b. become stronger
c. disappear completely d. partially affected
6. Steep valleys formed due to flowing water erosion are called _____.
a. hills b. sand dunes c. canyons d. deltas
7. A canyon may take _____ to be formed.
a. minutes b. hours c. days d. years

2 Put (✓) or (X):

1. If we walk along a sand dune, our footprints will remain there the next day. ()
2. The formation of canyons is considered a rapid change of the Earth's surface. ()
3. Strong winds can break rocks down and change different landscapes. ()

- 4 Sandcastles and coastal rocks face the same effect after collision with waves. ()
- 5 Coastal rocks have sloping sides at the bottom. ()
- 6 The Earth's surface changes from time to time. ()
- 7 All changes to the Earth's surface take hundreds of years. ()
- 8 Canyons take millions of years to be formed. ()
- 9 The Earth's surface never changes. ()
- 10 Water and wind are natural factors that cause the change in the Earth's surface. ()

Write the scientific term:

- 1 A natural factor by which canyons are curved. ()
- 2 They are deep valleys carved by the flowing water. ()

Correct the underlined words:

- 1 The Earth's surface is stable as time passes. ()
- 2 Gravity can change the shape of canyons. ()
- 3 The sandcastle becomes stronger after being hit by waves. ()
- 4 The shape of the canyon was formed in a very short time. ()

Complete the following using the words between the brackets:

(quickly - Coastal rocks - Wind - very slowly - steep - water - canyons - sandcastle)

- 1 The canyon has parts.
- 2 Sandcastles' shapes change, while canyons' shapes change
- 3 and can change the Earth's landscapes.
- 4 and have sloping sides at the bottom.

6 Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 The sandcastle's shape	a. can be changed very slowly by the effects of water or wind.
2 The coastal rock's shape	b. can be changed quickly by the effects of wind or water.
	c. can be changed very slowly by the effects of water only.
1 _____	2 _____

7 Study the following figures, then complete the following sentences:



Figure (1)



Figure (2)



Figure (3)

- Figure (_____) has steep parts and sloping sides.
- Figures (_____) and (_____) are changed very slowly, while figure (_____) is changed very quickly.
- After many hours, figure (_____) will disappear completely.

8 Give reasons for:

- The Earth's surface is always changing.

2 Changes to the Earth's surface occur at different times

3 The sandcastle completely disappears after a short time.

4 There may be a little difference in the shape of coastal rocks after a lot of years.

What happens if?

1 Waves of seawater hit your sandcastle?

2 A sandcastle and a coastal rock are left for an hour?

Lesson

2



Activity

4

What Do You Already Know About
Breaking Down and Moving Rocks?

Shaping the Earth

» There are **three** main processes that may cause changes to the Earth's surface.



يحدث ثلاث عمليات رئيسية قد تتسبب في تغيير مظاهر سطح الأرض:

1 عملية التجوية: تكسير وتفتيت الصخور.

2 عملية التعرية: نقل فئات الصخور أو التربة.

3 عملية الترسيب: إرساء الرواسب في الأسفل.



NOTE:

- Sediments could be sand, rock, or soil.

Activity 5 What Is Weathering?

What is the weather outside today? Is it sunny or rainy, windy or icy?
All these factors are part of the weather and are also involved in weathering.
Weather and weathering are different where,

Concept 1

Weather

Is the condition of the atmosphere at specific place.

الطقس: هو حالة الجو في مكان معين.

Weathering

Is the process of breaking down rocks into small (tiny) particles.

التجوية: هي عملية تفتت الصخور إلى قطع صغيرة.

Weathering may cause

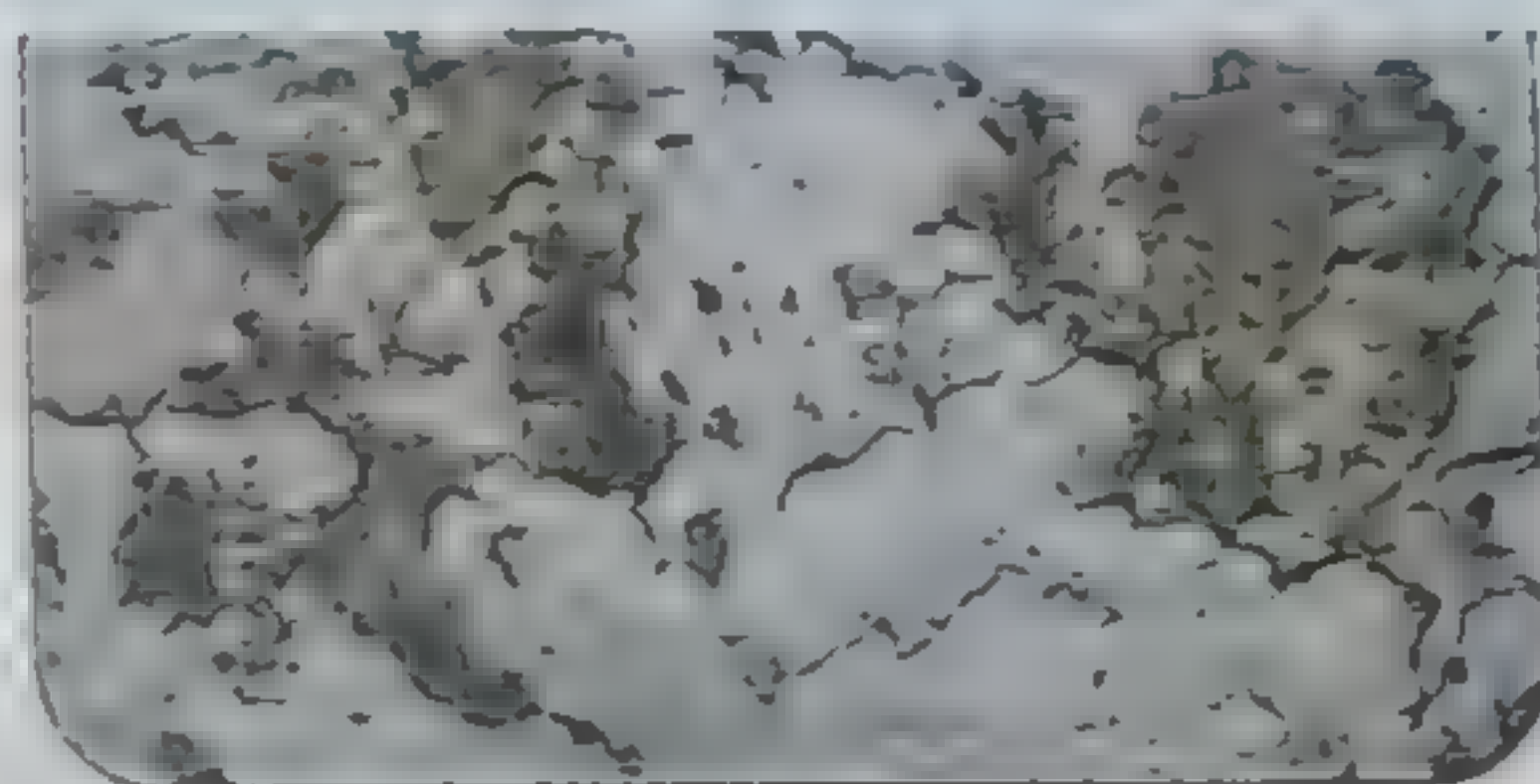
1

A breakdown (crumbling) of statues.



2

Paint to peel on a building.



3

Waves to pull sand from the beach.



NOTES

- Weathering breaks down big rocks into tiny rocks, then into pebbles or sand grains.
- Knowing the weather helps you decide what to wear when you go outside.

تعمل التجوية على تفتت الصخور الكبيرة إلى صخور صغيرة ثم إلى حصى أو حبيبات رمل.
يساعدنا معرفة حالة الطقس على تقرير ما سنقوم بارتدائه خارجًا.

Check your understanding?

Put (✓) or (X):

- Weathering can change the shape of landscapes over time. ()
- Weathering is the condition of the atmosphere in a specific place. ()



Activity 6

Types of Weathering

» Weathering is one of the factors that changes the Earth's surface.

» If you have seen rocks of different sizes, this is evidence of weathering.

Enormous rocks
(that makes up
mountains)

are broken
down into

boulders

are broken
down into

smaller
rocks

are broken
down into

التجوية من العمليات التي تُغيّر سطح الأرض.
إن صخوراً ذات أحجام مختلفة؛ فهذا دليل على عملية التجوية.
التجوية في تكسر الصخور الكبيرة (المكوّنة للجبال) إلى صخور أصغر إلى أن تصبح رمالاً.

Types of Weathering

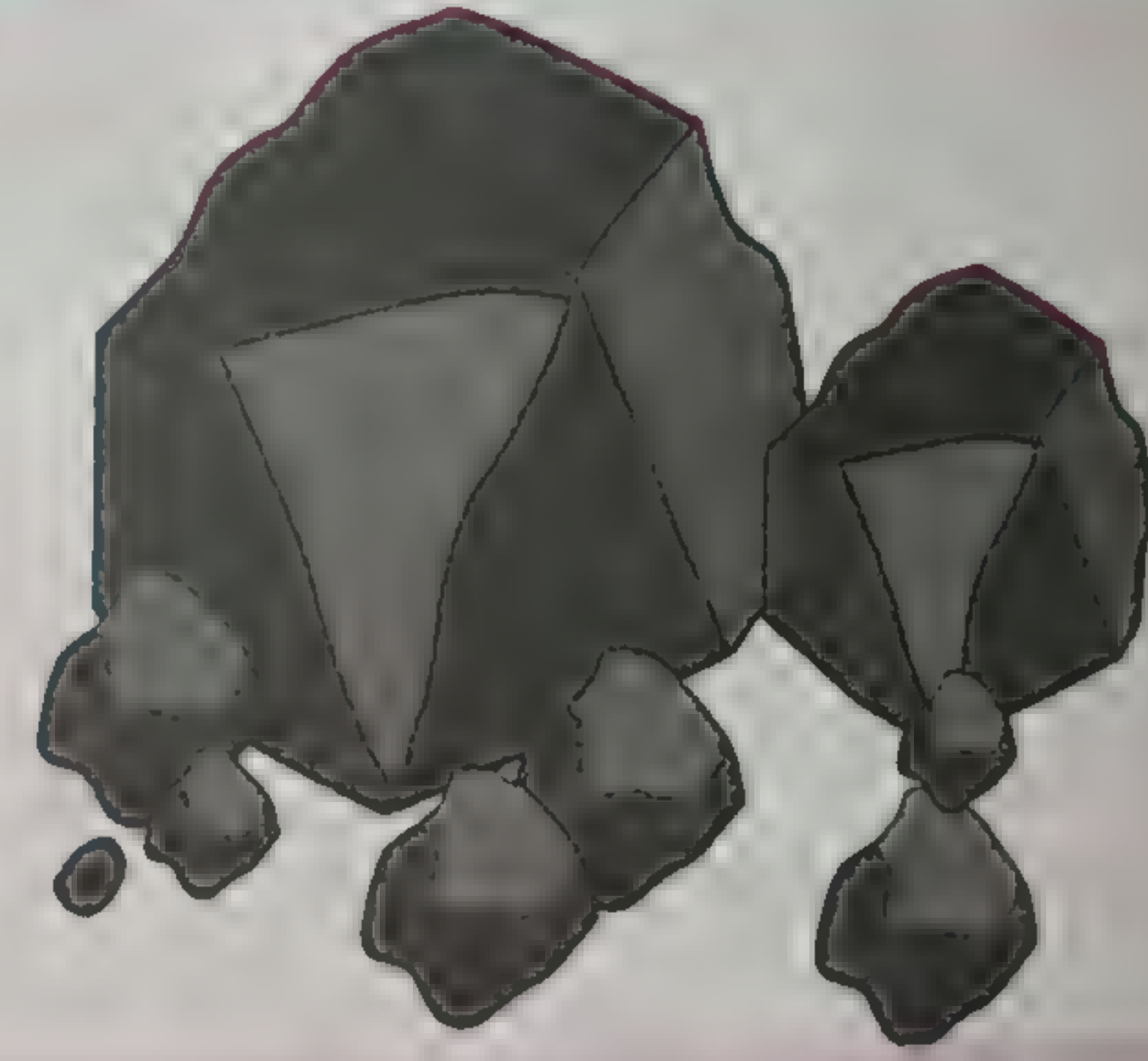
1 Chemical Weathering



The process of breaking rocks down **with** a change in their structure (nature) due to chemical reactions.

عملية تفتت الصخور مع تغيير تركيبها بسبب التفاعلات الكيميائية.

2 Mechanical Weathering



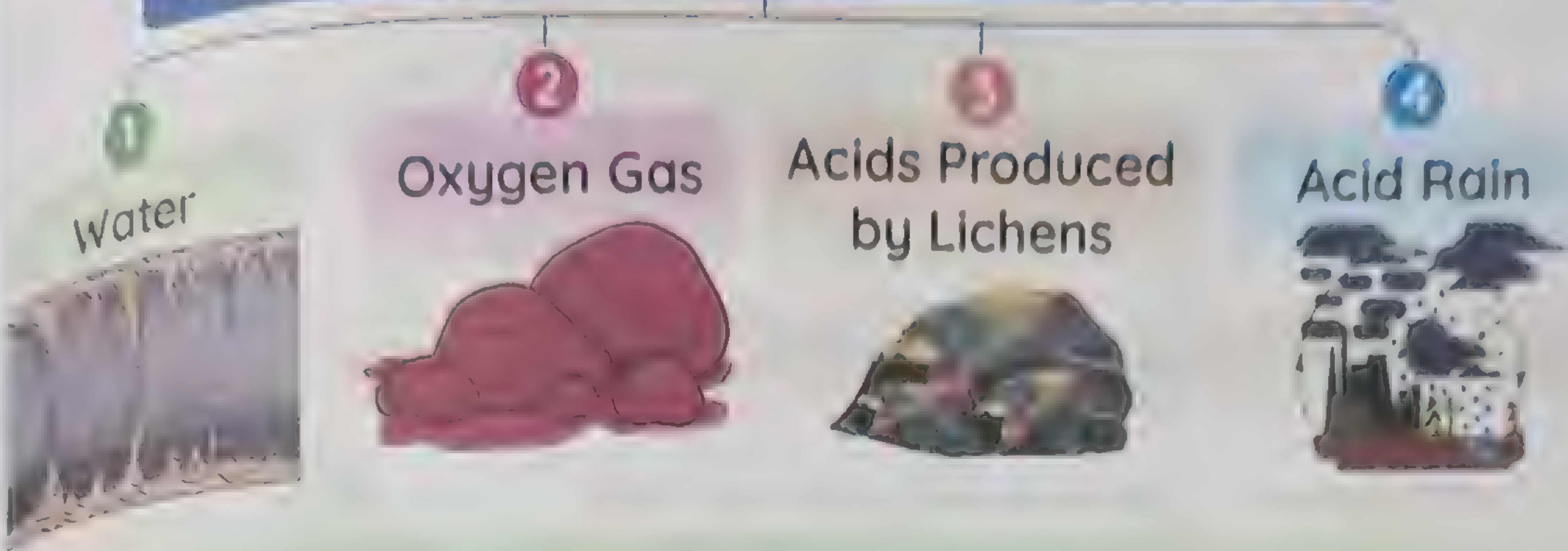
The process of breaking rocks down **without** a change in their structure (nature) due to physical factors.

عملية تفتت الصخور بدون تغيير تركيبها بسبب العوامل الفيزيائية.

Chemical Weathering

It is the change in the structure of rocks due to chemical reactions
التجوية الكيميائية: هي التغير الذي يحدث لتركيب الصخور بسبب التفاعلات الكيميائية.

Reasons (Factors) of Chemical Weathering



1 Water:

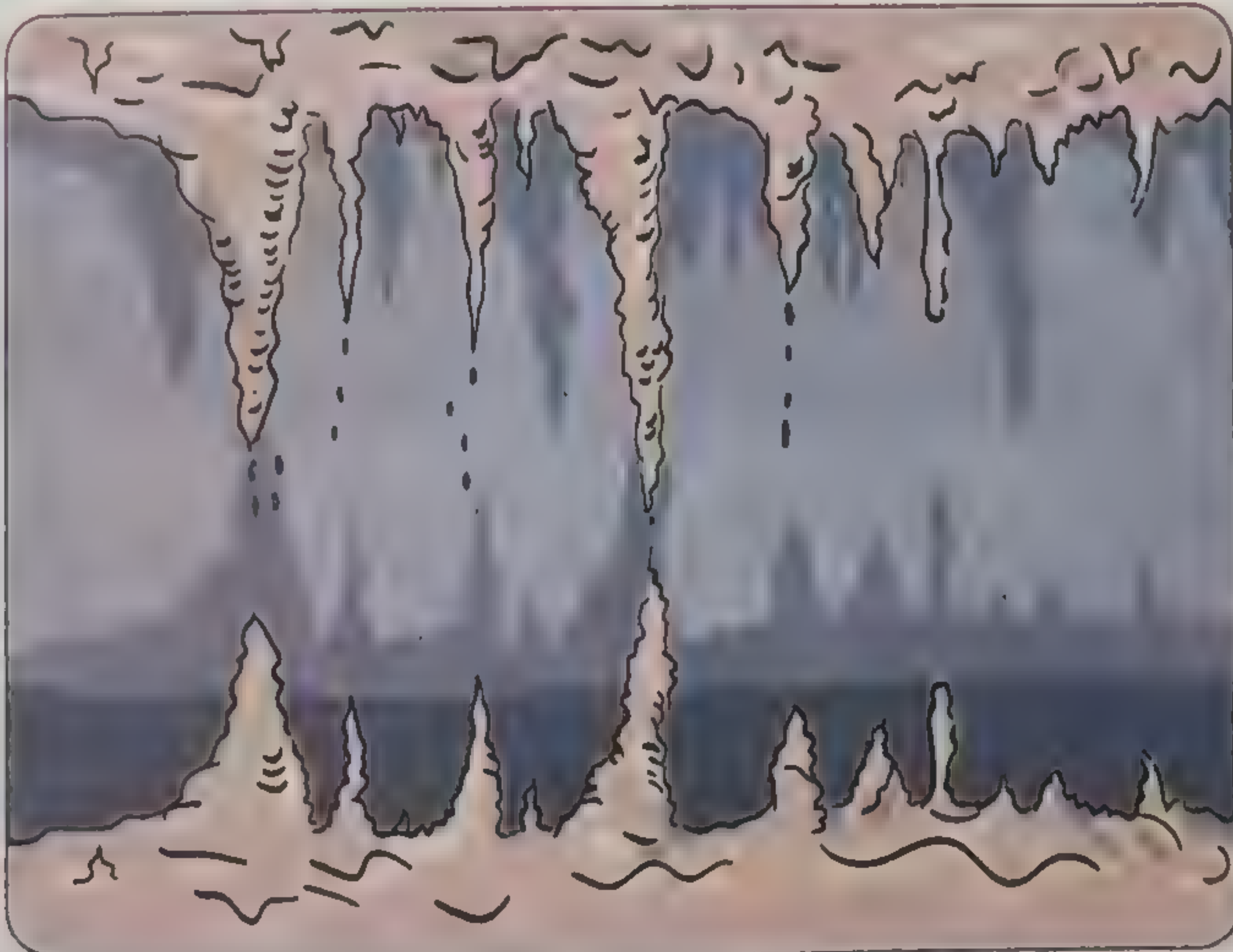
As water runs over rocks:

- It dissolves **some minerals** in rocks. This makes the rocks fall apart.
- Dissolved minerals combine again to form new shapes, as in a **limestone cave**.

يتسبب جريان المياه على الصخور في:

- ذوبان بعض المعادن المكونة لهذه الصخور؛ مما يؤدي إلى تآكل هذه الصخور.
- قد تتحد أجزاء الصخور المذابة مع مواد أخرى؛ لتكوّن أشكالاً جديدة كما في الحجر الجيري الموجود في هذا الكهف.

» Most caves are formed due to this type of chemical weathering.



2 Oxygen Gas:

- **Oxygen** in the air reacts with **iron** in some rocks forming **red-colored rust**.
- This reaction also weakens rocks, causing them to break more easily.

الأكسجين الموجود في الهواء مع الحديد المكون لبعض الصخور يُنتج صدأًا أحمر اللون. يسبب هذا التفاعل في إضعاف تماسك الصخور وتفتتها بسهولة.

5 Acids Produced by Lichens:

- **Lichens** are tiny plant-like organisms that produce acids on rocks as they grow.
- Over time, acids dissolve minerals found in these rocks, and break them down easily.

الليشنيات: هي كائنات دقيقة تشبه النباتات، تنتج أحماضًا على الصخور أثناء نموها. مع مرور الوقت تعمل الأحماض على إذابة المعادن المكونة للصخور؛ مما يتسبب في تكسير الصخور.

4 Acid Rain:

- Acid rain can also dissolve minerals found in these rocks, causing the breakdown of rocks.

• يمكن للأمطار الحمضية أيضًا أن تُسبب إذابة المعادن المكونة للصخور؛ مما يتسبب في تكسير الصخور.

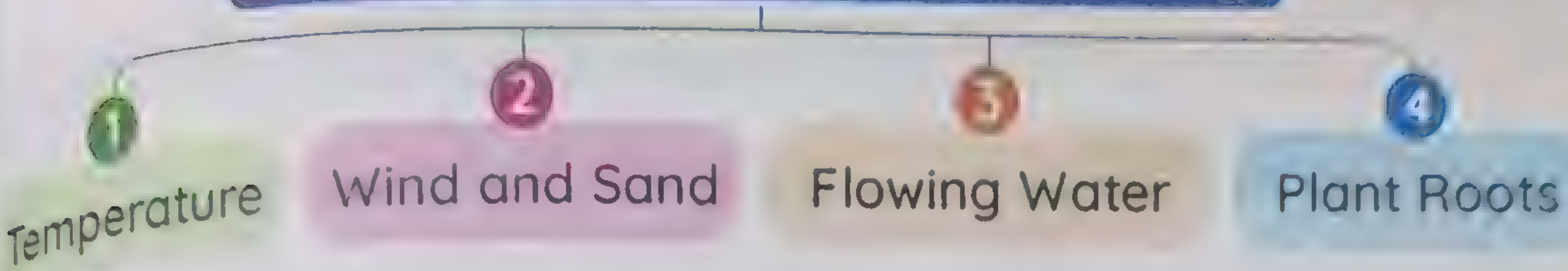


Mechanical Weathering

It is the breaking down of rocks due to the effect of physical factors.
الانحوية الميكانيكية هي عملية تفتت الصخور بسبب تأثير العوامل الفيزيائية.

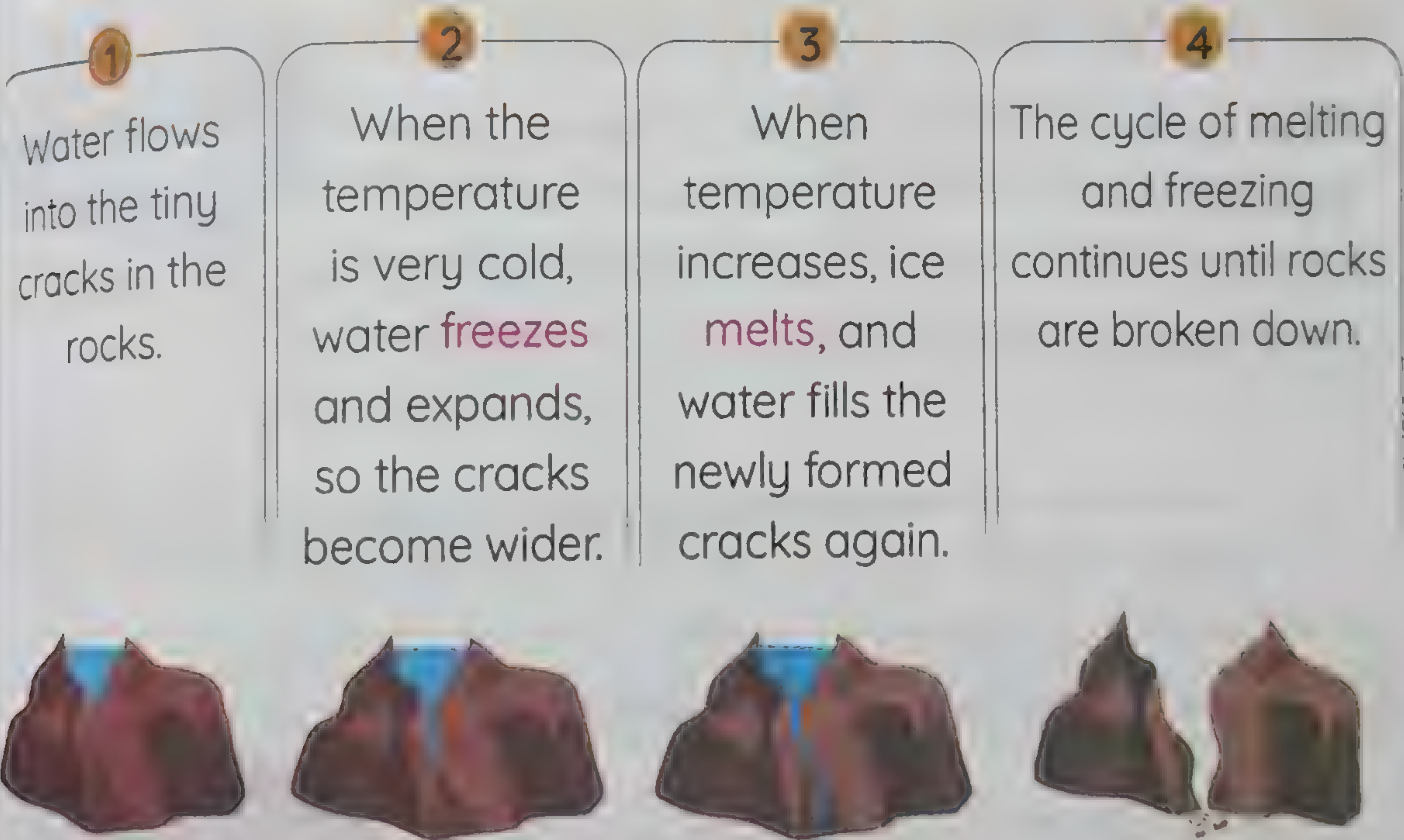
Concept

Physical Factors: Reasons for Mechanical Weathering



1 Temperature:

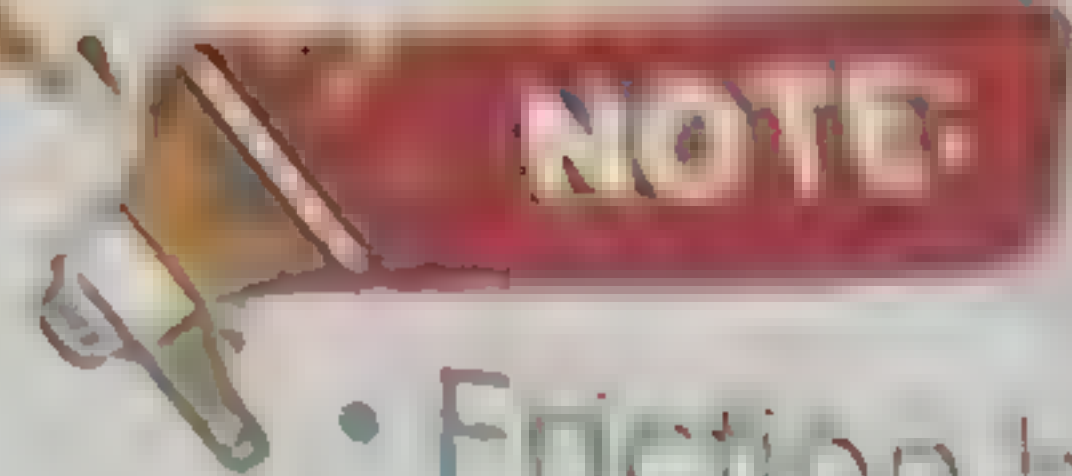
Water and temperature often work together to break rocks.



- 1 يتسلل الماء ويتغلغل داخل شقوق الصخور الدقيقة.
- 2 عند انخفاض درجة الحرارة يتجمد الماء ويتمدد داخل الشقوق؛ مما يتسبب في اتساع هذه الشقوق أكثر.
- 3 عند ارتفاع درجة الحرارة ينصهر الثلج وتملأ المياه الشقوق الجديدة التي تكونت.
- 4 تستمر دورة الانصهار والتجمد إلى أن تنكسر الصخور.

2 Wind and Sand:

- Sand and wind team up to wear down large rocks.
- 1 Wind rushes sand on the rock surface.
- 2 Friction occurs between sand and rocks.
- 3 This causes the smoothing of rocks and breaks them down.



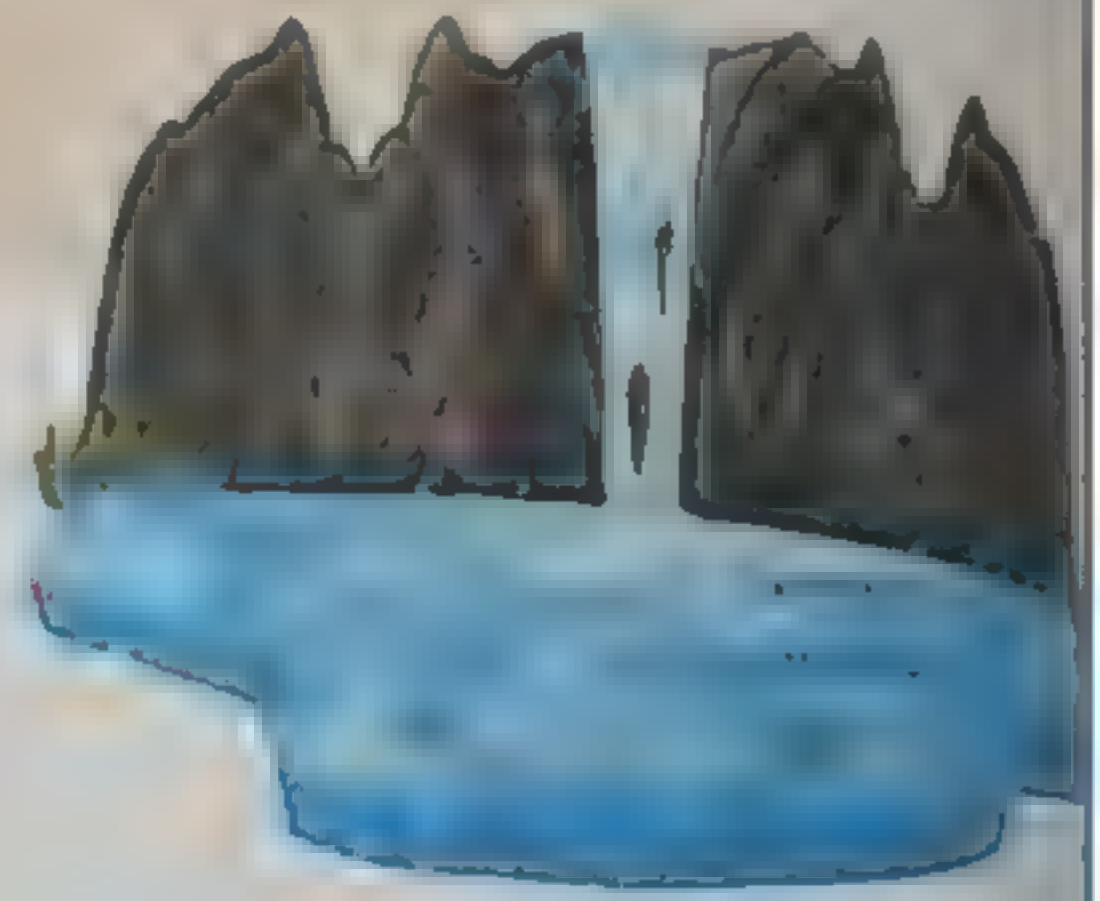
NOTE:

- Friction between sand and rocks is like the force of sandpaper on a piece of wood.

تسبب الرمال والرياح في تآكل الصخور الضخمة.
تقوم الرياح بدفع الرمال على أسطح الصخور. 2 تحدث قوة احتكاك بين الرمال والصخور.
تسبب تلك القوة في صقل الصخور وتفتتها بعد ذلك.
تسبب قوة الاحتكاك بين الرمال والصخور مثل قوة استخدام ورق الصنفرة على قطعة الخشب.

3 Flowing Water:

- Flowing water, full of small bits of **floating gravel** and **sand**, scours the rough edges of boulders.
- Rushing water causes rocks to tumble over one another, breaking larger pieces when collisions occur.



المياه المندفعة «الجارية»:
تغسل المياه الجارية بقطع صغيرة من الحصى والرمل المنجرف التي تصقل تلك القطع صغيرة الحواف الخشنة للصخور.
تسبب المياه المندفعة في تراكم الصخور واحدة فوق الأخرى؛ مما يتسبب في تكسر قطع الصخور الكبيرة عند ارتطامها معاً.

4 Plant Roots:

- 1 Plant roots grow inside the cracks of rocks.
- 2 Cracks become wider.
- 3 Rocks are broken down.



تطور الأشجار:
1 تنمو جذور النباتات في شقوق الصخور. 2 يتسبب ذلك في اتساع الشقوق. 3 تتفتت الصخور.

We can see the effects of weathering all around us in the little rocks, pebbles, and sand that were parts of much larger structures.

Give a reason for...



It's hard to see weathering in action.

Because weathering happens over long periods of time.

Concept

P.O.C	Chemical Weathering	Mechanical Weathering
Definition	The process of breaking rocks down with a change in their structure (nature) due to chemical reactions .	The process of breaking rocks down without a change in their structure (nature) due to physical factors .
	• عملية تفتت الصخور مع تغيير تركيبها بسبب التفاعلات الكيميائية.	• عملية تفتت الصخور بدون تغيير تركيبها بسبب العوامل الفيزيائية.
Reason (Factors)	<ol style="list-style-type: none"> 1 Water 2 Oxygen gas 3 Acids produced by lichens 4 Acid rain 	<ol style="list-style-type: none"> 1 Temperature 2 Wind and sand 3 Flowing water 4 Plant roots

Check your understanding?

» Classify these situations by writing the letters (M) for mechanical weathering and (C) for chemical weathering:

- 1 Water freezes inside the cracks in rocks. ()
- 2 Water dissolves minerals in limestone caves. ()
- 3 Rushing water causes the smoothing of rocks. ()
- 4 Plant roots grow into the cracks of rocks. ()
- 5 Formation of red-colored rust. ()

Exercises on Lesson 2

1 Choose the correct answer:

1. _____ weathering is the change in structure of a rock.
 a. Physical b. Chemical c. Mechanical d. Electrical
2. The existence of rocks in different sizes is evidence of _____.
 a. melting b. weathering c. erosion d. deposition
3. Weathering changes the mountains in the following order:
 a. Small rocks → boulders → then sand
 b. Sand → small rocks → boulders
 c. Boulders → small rocks → sand
 d. Sand → boulders → small rocks
4. Oxygen can rust _____.
 a. a glass b. paper c. a rock d. plastic
5. Plant _____ play an important role in the mechanical weathering process.
 a. leaves b. stems c. roots d. flowers
6. All of the following are reasons for chemical weathering, except _____.
 a. water b. plant roots c. acid rain d. oxygen gas
7. _____ may cause chemical or mechanical weathering.
 a. Lichens b. Oxygen c. Water d. Plant's roots
8. _____ produce acids as they grow on rocks.
 a. Insects b. Plant roots c. Beetles d. Lichens
9. Which of the following examples represents mechanical weathering?
 a. Red-colored rust on rocks. b. Acid rain falls on rocks.
 c. Roots grow inside rocks. d. Water dissolves minerals.
10. _____ and _____ cause chemical weathering.
 a. Lichens - plant roots b. Acid rain - oxygen
 c. Melting - freezing d. Sand - wind

- 11 Sand is formed due to the breaking down of _____
 a. glass b. plastic c. glass d. rocks
- 12 Limestone caves are formed due to the combination of _____
 a. dissolved minerals b. insoluble minerals
 c. red-colored rust d. acid rains
- 13 _____ is the process in which sediments are carried to another place.
 a. Deposition b. Erosion c. Weathering d. Melting
- 14 Dissolving minerals from rocks to recombine with new substances is an example of _____.
 a. mechanical weathering b. weathering by wind
 c. chemical weathering d. erosion
- 15 All the following are processes that change the Earth's surface, except _____.
 a. erosion b. digestion c. weathering d. deposition
- 16 Lichens produce _____ that dissolve(s) minerals found in rocks.
 a. oxygen b. rains c. water d. acids
- 17 All of these are types of sediments, except _____.
 a. pebbles b. sand grains c. lichens d. rocks fragments

2 Put (✓) or (X):

- 1 The deposition process takes place before the erosion process. ()
- 2 We can see weathering in action everywhere around us. ()
- 3 Weathering is the condition of the atmosphere in an area. ()
- 4 Living organisms may cause mechanical and chemical weathering. ()
- 5 Acid rain has the same effect on rocks as plant roots. ()
- 6 Melting and freezing change the volume of water in a rock's cracks and make them wider. ()

Shifting Surfaces

- 7 The broken down statues are evidence of the deposition process.
- 8 Plant roots help in the formation of rocks.
- 9 Rocks become stronger when iron found in them rusts.
- 10 Wind is one of the agents that cause weathering.
- 11 Weathering may occur due to collision (friction) between rock and sand carried by wind.

Correct the underlined words:

- 1 The shaping of the Earth's surface begins with erosion process. (.....)
- 2 When oxygen reacts with the iron in rocks, a green-colored rust is formed. (.....)
- 3 Stems of plants grow inside cracks of rocks, causing them to break down. (.....)
- 4 Carbon dioxide in the air always causes rust on rocks. (.....)
- 5 Limestone caves were formed due to mechanical weathering. (.....)
- 6 As plant roots grow inside rocks, the cracks become narrower. (.....)
- 7 The origin of sand is the breaking down of glass. (.....)

Complete the following using the words between the brackets

(Mechanical - Acid rain - chemical - oxygen - Acids - iron - plant roots)

- 1 The melting and freezing cycle has the same effect as, as they make the cracks in rock become wider.
- 2 produced by lichens may dissolve rocks.
- 3 has the same effect of lichens on rocks.
- 4 weathering and weathering are types of weathering.
- 5 When the in air reacts with in rocks, a red-colored rust is formed.

Write the scientific term:

- 1 The process of moving rocks from one place to another ()
- 2 The process of breaking boulders down into smaller rock particles ()
- 3 The process of laying sediments down ()
- 4 The kind of weathering that takes place by the effect water and temperature. ()
- 5 The kind of weathering that changes the structure and color of rock. ()
- 6 They are tiny, like plants, that live on rocks and produce acid on them. ()
- 7 The gas that causes the red-colored rust on some rocks. ()
- 8 A part of the plant that breaks down rocks as they grow through them. ()
- 9 A type of caves formed due to combination of dissolved minerals of rocks. ()
- 10 A mineral in rocks that reacts with oxygen forming red-colored rust. ()

Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 Lichens	a. causes mechanical weathering for rocks.
2 Water	b. causes the red-colored rust on a toy car.
3 Oxygen	c. produce acids as they grow.
4 Melting and freezing	d. may cause both types of weathering.

1 _____ 2 _____ 3 _____ 4 _____


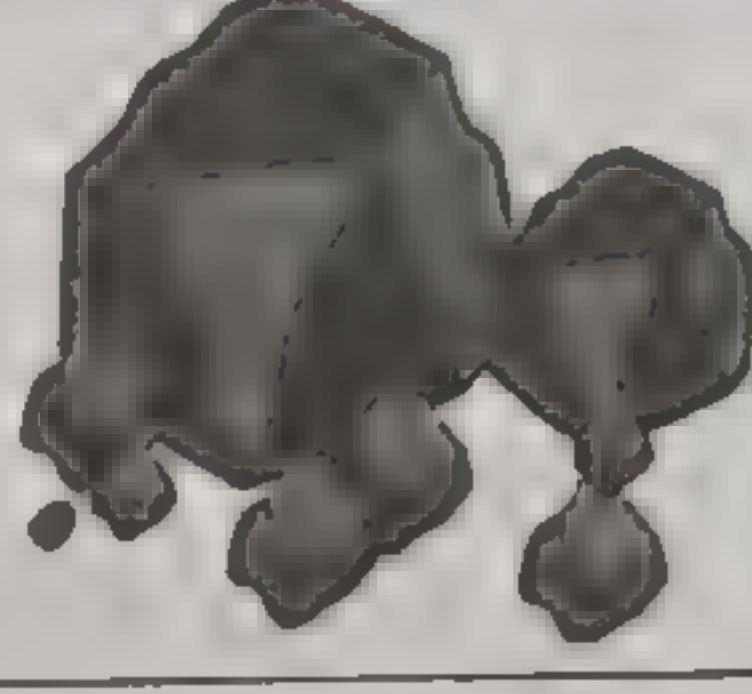


Arrange the following steps:

- () Ice melts, and water fills the newly formed cracks.
- () Water freezes, expands, and widens the cracks.
- () The melting and freezing cycle continues.
- () Water finds its way into rock cracks.

Classify these situations by writing letters (M) for mechanical weathering and (C) for chemical weathering:

- Plant roots grow into the cracks of rocks. ()
- Iron rust formed on a toy car. ()
- Water freezes inside the cracks of rocks. ()
- Water dissolves the minerals in the limestone cave. ()
- Acid rain falls and breaks down the rocks. ()
- Oxygen reacts with iron in rocks, which weakens iron-rich rocks. ()
- Wind rushes sand onto the rock surface. ()
- Acids from lichens eat away the rocks where they grow. ()

Study the following figures, then complete the following sentences:

			
Figure (1)	Figure (2)	Figure (3)	Figure (4)

- Figure () represents a living organism that causes mechanical weathering.
- Figure () represents a living organism that causes chemical weathering.
- Oxygen gas has a bad effect on rocks in figure ().

Give reasons for:

- 1 Knowing the weather conditions is very important
- 2 Weathering may appear on statues and buildings
- 3 The rocks around us exist in different sizes.
- 4 Rust appears on some old toy cars.
- 5 Oxygen in the atmosphere has a bad effect on some rocks.
- 6 Lichens break down rocks as they grow.
- 7 Sometimes, sand has the same force as sandpaper on a piece of wood.
- 8 Plant roots are considered a physical factor of mechanical weathering.

What happens if?

- 1 A metal toy is left outside and exposed to air and rain?
- 2 Flowing water with gravel and sand collides with boulders?
- 3 Oxygen gas reacts with iron rocks forming a red-colored rust?
- 4 Acid rain falls on rocks?
- 5 Water runs through limestone caves?
- 6 Lichens grow on rocks produce acid?
- 7 Plant roots grow inside rocks?

Lesson

3

Hands-on Investigation: Modeling Mechanical and Chemical Weathering



Activity



Experiment



In this activity, students will investigate the similarities and differences between mechanical and chemical weathering.

يهدف الطلاب بالتطبيق في أوجه التشابه والاختلاف بين التجوية الميكانيكية والكيميائية.

Tools:

Two pieces of biscuits	Napkin	A cup of water	Antacid tablets

Steps:

a

A model of mechanical weathering



1 Crush a piece of biscuit with your hand on the napkin.

b

A model of chemical weathering



2 Place a piece of biscuit in the cup, then add water and antacid tablets to it.

Observation:

- In the model of mechanical weathering, the biscuit is broken into small pieces, but it is still the same material.
- In the model of chemical weathering, a completely different new substance "dough" is formed.

Conclusion:

- Mechanical weathering breaks down rocks into smaller pieces without changing their structure.
- Chemical weathering breaks down rocks into smaller pieces, and changing their structure.

Give a reason for... 

Chemical weathering causes greater changes to substances than mechanical weathering.

Because chemical weathering causes a completely new different matter, while mechanical weathering breaks the matter down into small pieces without changing it.

Check your understanding?

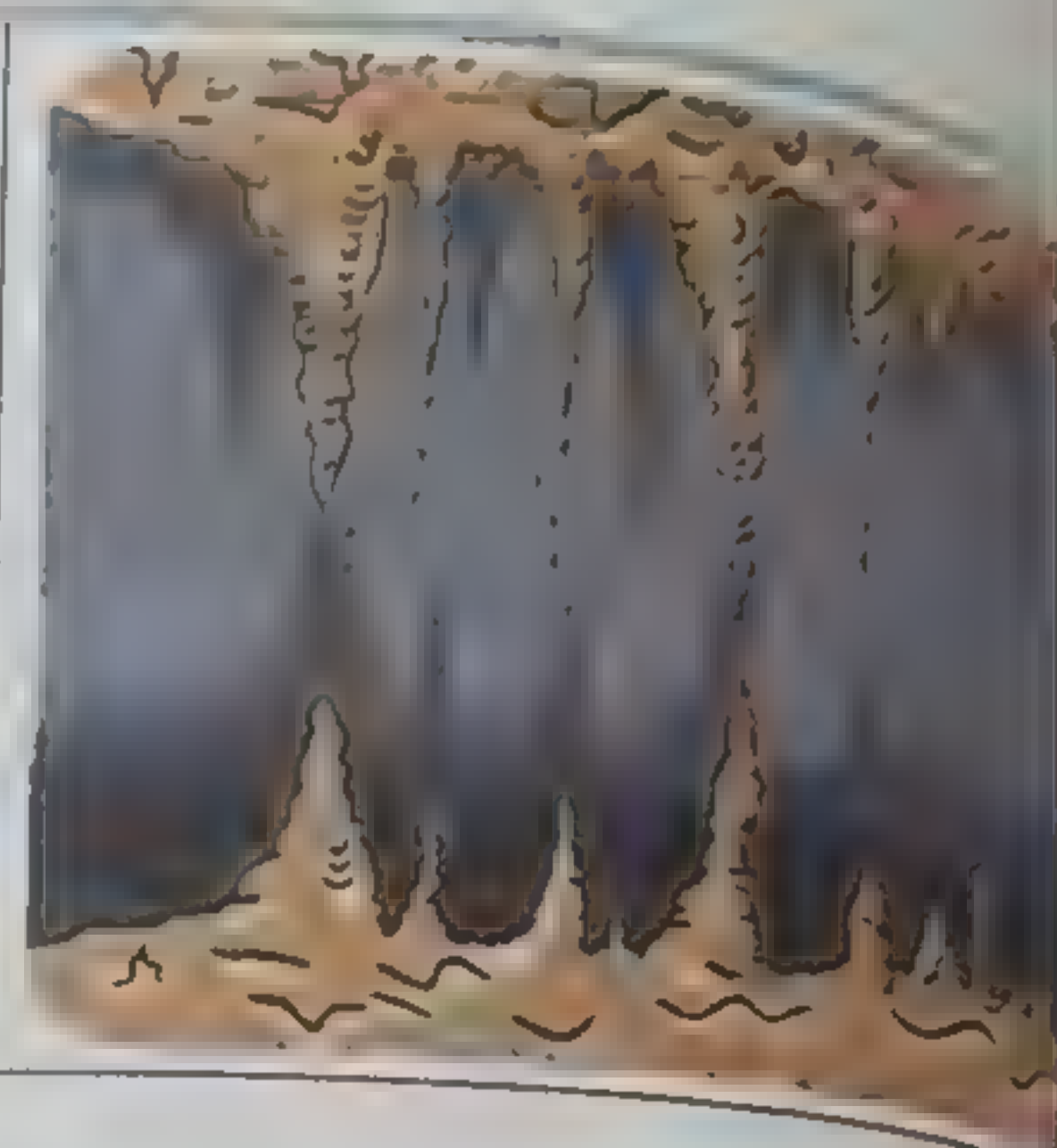
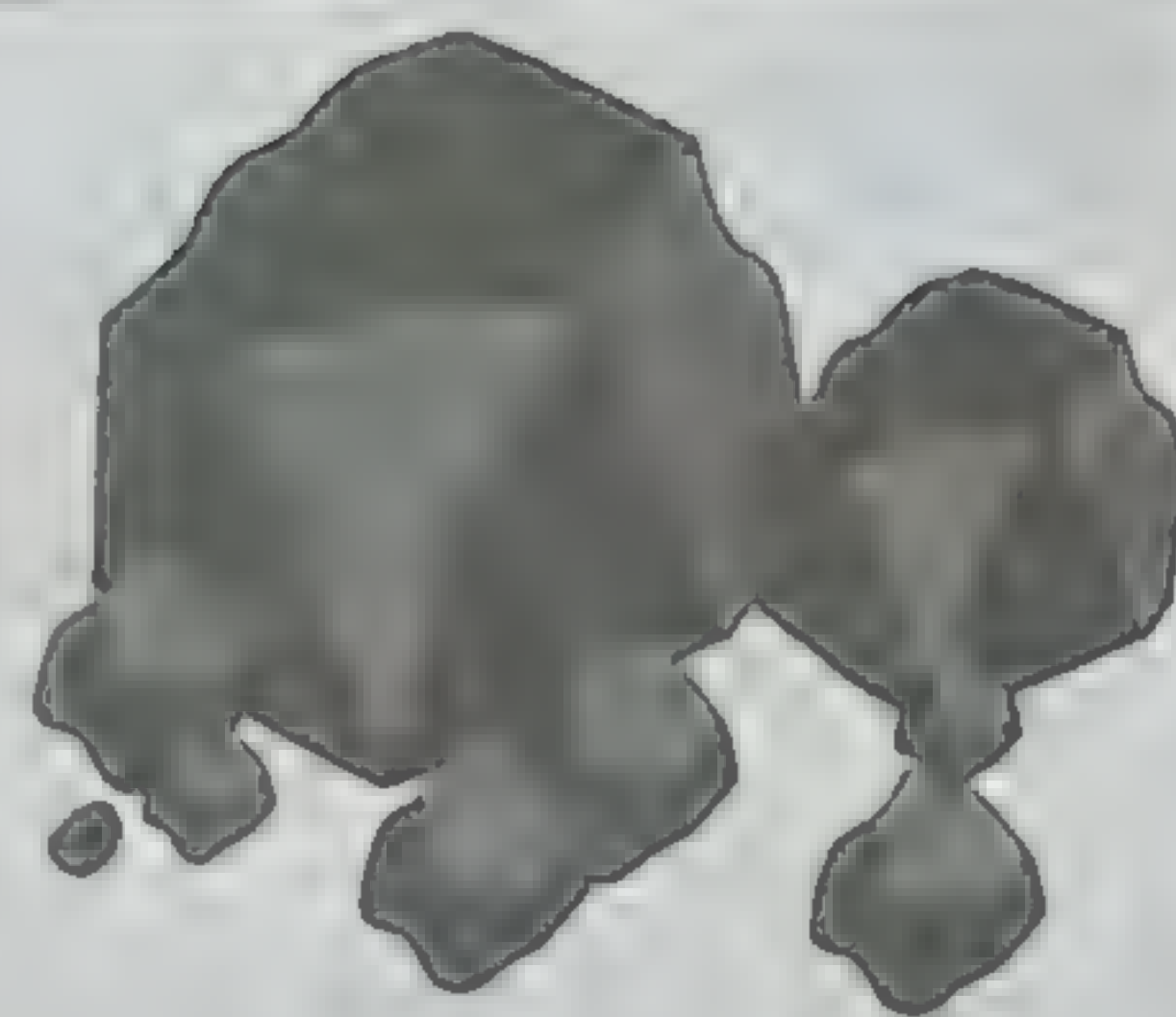
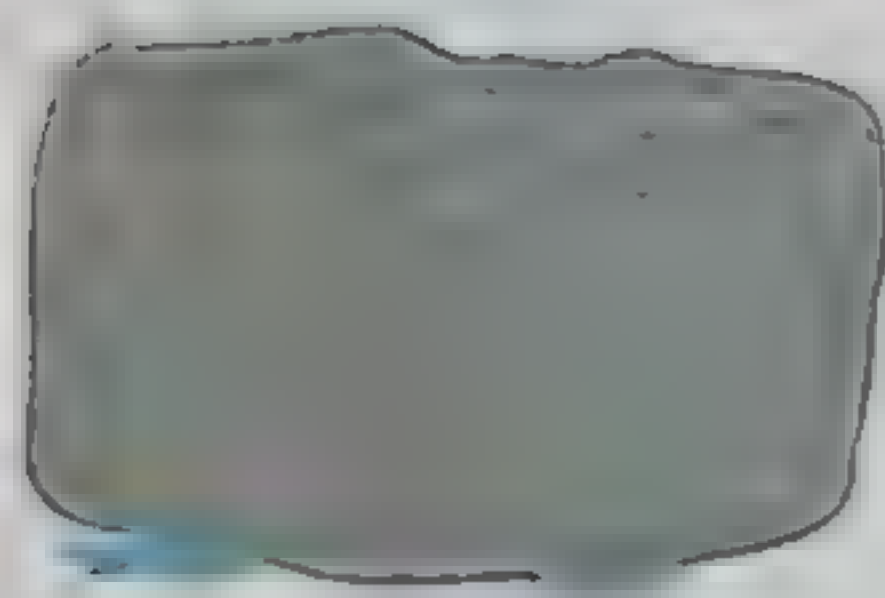
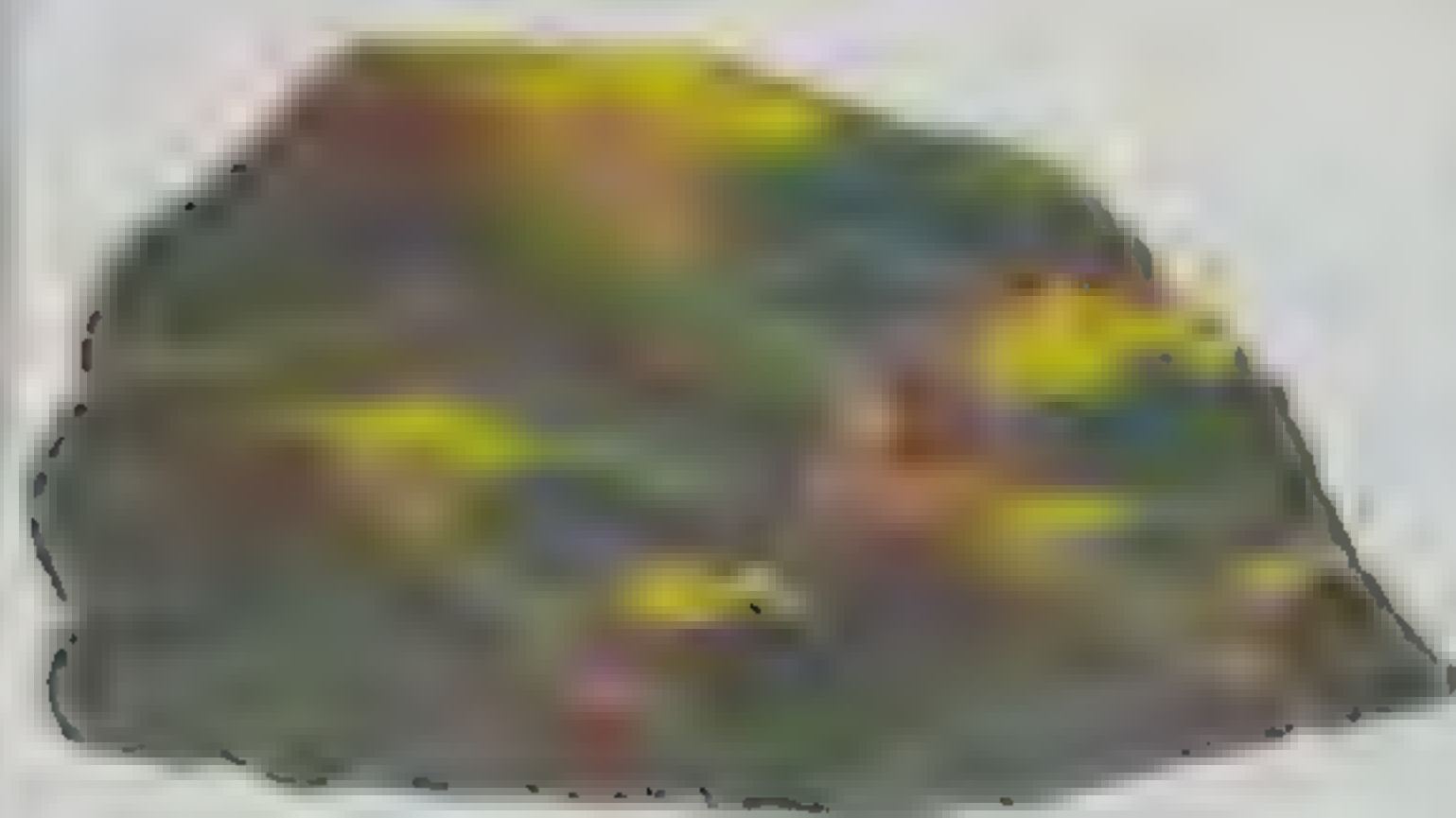
» Put (✓) or (X):

- 1 Scientists use models of weathering because it is hard to see weathering in action. ()
- 2 The weathering process usually takes a few days to happen. ()
- 3 Mechanical weathering always produces a new substance. ()
- 4 Water may cause mechanical weathering or chemical weathering. ()



Activity 8 Weathering

Study the following figures, then classify them by writing letter (M) for mechanical weathering and (C) for chemical weathering.



Exercises on Lesson 3

Choose the correct answer:

1. Crushing a piece of ice into small pieces is considered a model of _____ weathering.
a. biological b. chemical c. mechanical d. electrical
2. _____ is a model of chemical weathering.
a. Cutting vegetables to make salad
b. Adding antacid tablet and water to a biscuit
c. Breaking down a glass by a hammer
d. Dividing a loaf of bread by a knife
3. All the following are properties of chemical weathering, except that _____.
a. it changes the material of rocks completely
b. it keeps the material of rocks
c. it may dissolve rocks completely
d. it produces greater changes to the rocks
4. Which of the following changes the matter of rocks?
a. Roots grow in rocks.
b. Lichens produce acid on rocks.
c. Strong wind d. Heavy rain
5. The process of breaking down rocks on the Earth's surface is called _____.
a. erosion b. weathering c. decomposition d. deposition
6. When acid rain falls on a building, all the following may occur, except _____.
a. chemical weathering b. a change in the paint color
c. a change in its rocks structure d. mechanical weathering

Shifting Surfaces

7 Which process describes water getting into cracks, freezing, and breaking the rocks or apart?

a. Erosion

c. Mechanical weathering

b. Chemical weathering

d. Deposition

4

Unit

2

Put (✓) or (X):

- 1 Chemical weathering causes greater changes than mechanical weathering. ()
- 2 Putting some nuts in a mixer is a model of chemical weathering. ()
- 3 Both mechanical and chemical weathering processes break down rocks into smaller pieces. ()
- 4 Putting biscuits in water and adding an antacid tablet resembles the effect of chemical weathering. ()
- 5 If a rock undergoes chemical weathering, its size and structure stay the same. ()
- 6 Chemical weathering changes the composition of the rocks. ()

3

Correct the underlined words:

- 1 When a metal statue slowly turns green, it is considered mechanical weathering. ()
- 2 Weathering takes a short time in the real world. ()
- 3 Dividing a bar of chocolate into smaller pieces is a model of chemical weathering. ()
- 4 Growing roots inside a rock, causing chemical weathering. ()

4

Complete the following using the words between the brackets

(breaks down - mechanical - matter - Chemical - long - short)

- 1 _____ weathering changes the matter greater than _____ weathering.
- 2 Chemical weathering always changes the _____ of rocks.

- 1 Mechanical weathering always _____ rocks without changing its matter.
- 2 Weathering always takes a _____ time, but we can see its effects on rocks.

Write the scientific term:

- 1 It is a type of weathering that occurs in rocks and leads to the formation of a completely different material. (_____)
- 2 It is a type of weathering that breaks rocks down without changing their matter. (_____)

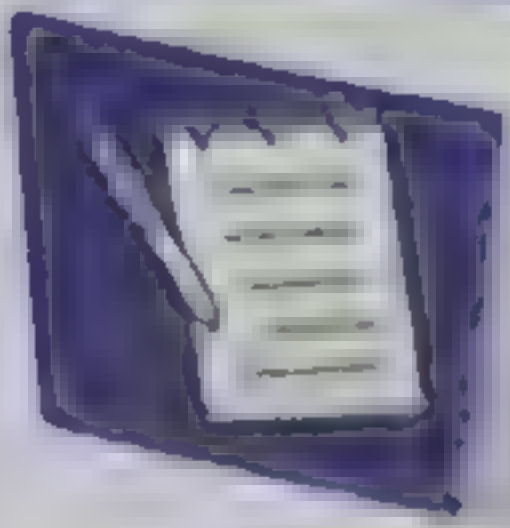
Give reasons for:

- 1 Crushing a biscuit into small pieces is a model of mechanical weathering.
- 2 Putting biscuits in water and adding an antacid tablet to it is a model of chemical weathering.
- 3 Chemical weathering causes greater changes to the rocks.

What happens if?

- 1 We crush a biscuit into small pieces?
(Concerning the type of weathering and resulted material).
- 2 We submerge some biscuits in hot tea?
(Concerning the type of weathering and resulted material).

Lesson 4



Activity 9 Erosion

- » When rocks are weathered, they are broken down into smaller pieces, so these small pieces are ready for erosion.

Erosion

It is the process of moving small particles of sand, soil, or rocks from one place to another.

عملية التعرية: هي العملية التي تحدث عند انتقال الجسيمات الصغيرة من الرمال أو الصخور أو التربة من مكان إلى آخر.



Factors affecting erosion

1 Gravity

2 Wind

3 Water

1 Erosion by Gravity:

- Gravity pulls broken rocks down a mountainside.
- تسحب الجاذبية الأرضية الصخور من جوانب الجبال إلى أسفل.

2 Erosion by Wind:

- The wind carries grains of sand from one place to another.
- A gentle wind moves grains of sand for a short distance (about meters).
- Stronger wind will blow more sand for a longer distance.

- تحمل الرياح حبات الرمال من مكان لآخر.
- تحرك الرياح الخفيفة الرمال لمسافة قصيرة قد تكون متراً واحداً.
- تدفع الرياح الأقوى قدرًا أكبر من الرمال وتنقلها إلى مكان أبعد.



Erosion by Water:

Rivers and floods erode rocks and soil from their banks and carry them downstream.

• تعمل الأنهار على تعرية الصخور والتربة عن ضفافها وتحملها في اتجاه جريان النهر.



Sea waves pull sand away from beaches.

• تقوم الأمواج بسحب الرمال من الشواطئ.



Rain washes the soil on farms that are located beside downhills.

• تجرف مياه الأمطار التربة الزراعية القريبة من المنحدرات الجبلية.



Sometimes you can see erosion happening, such as:

- 1 During flash floods, hurricanes, or landslides.
- 2 You may see sediments carried down gutters by water runoff after a big rainstorm.
- 3 The water in a nearby creek appears muddy.

قد نشاهد عملية التعرية أحياناً من خلال:

- 1 الفيضانات المفاجئة أو الأعاصير أو الانهيارات الأرضية.
- 2 انتقال الرواسب بفعل جريان المياه بعد عاصفة قوية ممطرة.
- 3 تحوّل المياه إلى مظهر طيني أحياناً في جدول (ممر مائي) قريب.

They are pieces of weathered rocks that are moved by gravity, wind, and water.

Sediments:

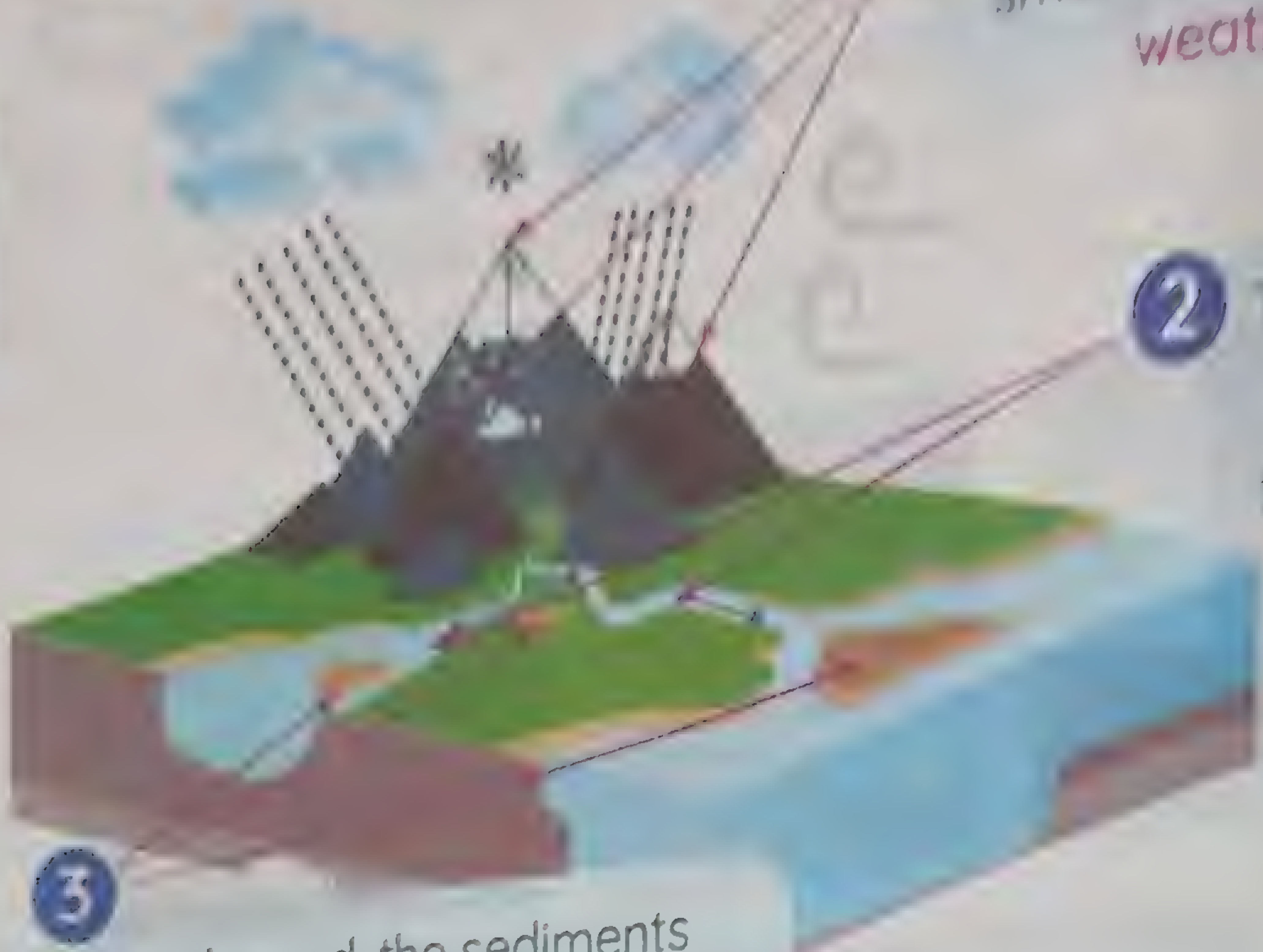
الرواسب: هي قطع الصخور التي تفتت بسبب التجوية، ثم تحركت من مكانها بفعل الجاذبية والمياه والرياح.

Check your understanding?

Put (✓) or (X):

- 1 Sometimes we can see erosion in action. ()
- 2 Water can play an important role in weathering and erosion. ()

Activity 10 Deposition



1 Rocks can be broken into smaller pieces through **weathering**.

2 These pieces are carried away through **erosion**.

3 At the end, the sediments settled by **deposition**.

Deposition • It is the process of settling rocks and soil in a new place after they have moved by erosion..
هو عملية استقرار الرواسب في مكان جديد بعد تحركها بفعل التعرية.

How does deposition occur?

- 1 As the wind blows, it picks up sand, then tosses it around in the air.
- 2 As the wind moves, sand travels with it.
- 3 When the wind stops blowing, the sand falls to the ground and is deposited.



عندما تهب الرياح، فإنها تحمل الرمال ثم تقذفها في الهواء. كلما تحركت الرياح تتحرك معها الرمال.
عندما تتوقف الرياح عن الحركة تسقط حبات الرمال وتستقر (تترسب) على الأرض.

The role of deposition by water

A river may deposit a sand bar along its banks. A river could carry sediment, and when the river meets the sea, sediments may be deposited and form a delta, such as the Nile Delta.



• يعمل النهر على ترسيب شريط من الرمال على طول ضفافه.
• يمشي النهر حوض الرواسب... وعندما يصب النهر في البحر تترسب بعض الرواسب التي يحملها النهر في قاع هذا الحوض.
• بذلك تتشكّل الدلتا مثل دلتا نهر النيل.

Delta

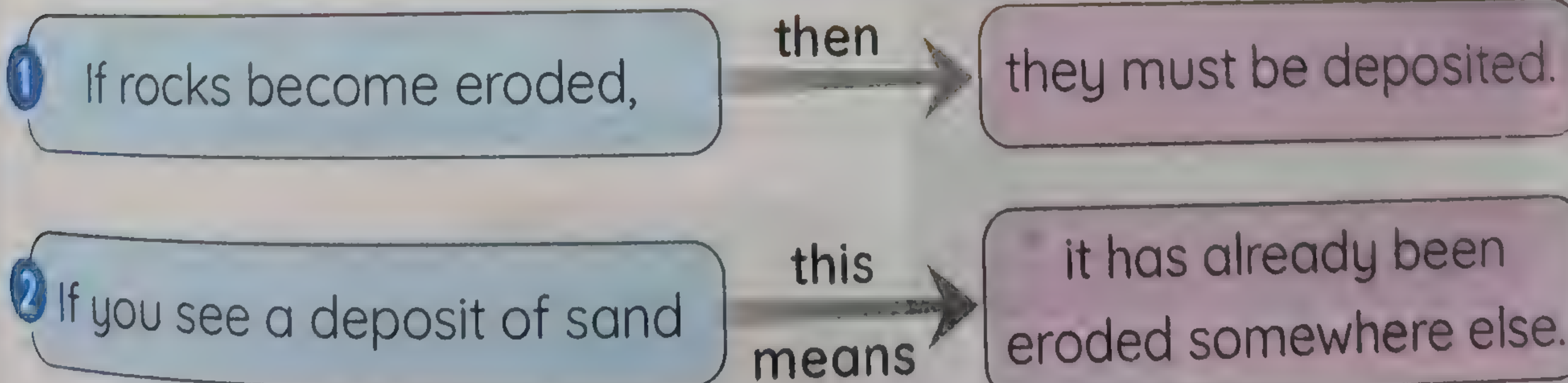
It is a fan-shaped (triangle-shaped) that has a mass of mud and sediments formed when a running river enters a large water body (sea or ocean).

The role of deposition by wind

- Strong wind can form large sand dunes, such as:
 - 1 Western Desert in Egypt
 - 2 Rub' Al Khali in Arabian Peninsula.

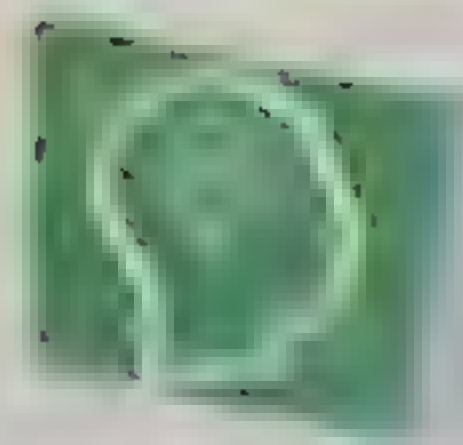
- Weak wind can form small sand dunes, such as: Small dunes on a beach.

Erosion and deposition are linked processes

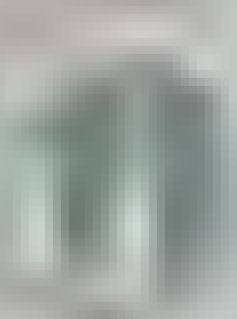


Lesson

5



Activity



Evidence of Change

- Look at the three images shown and consider what you have learned about the processes of **weathering**, **erosion**, and **deposition**.

Weathering



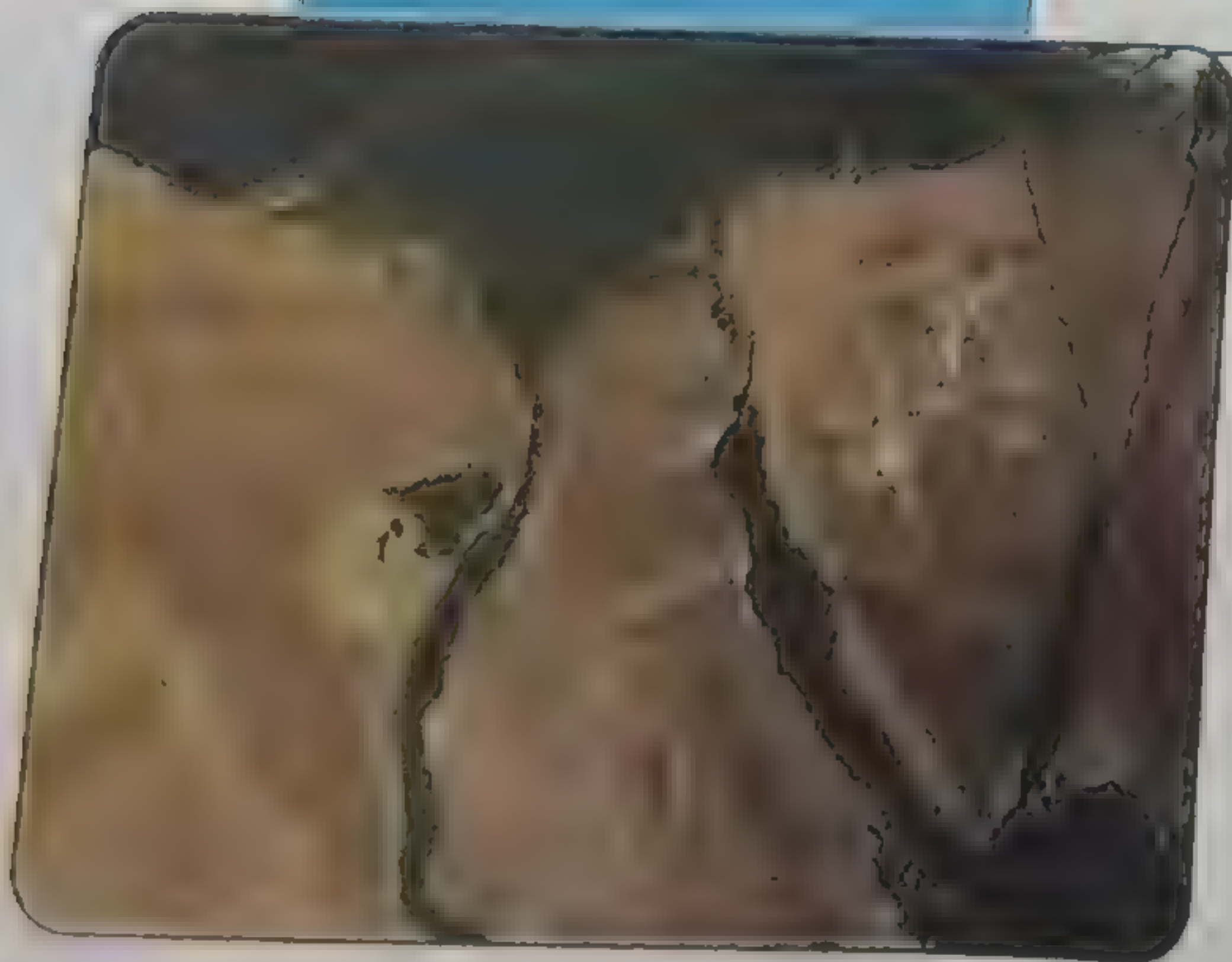
Weathering is caused when wind or water break down the rocks and change the shape of the landform by mechanical or chemical processes.

Erosion



Erosion is caused when wind or water move material from one place to another.

Deposition



Deposition occurs when eroded materials stop moving and settle on a surface, often forming layers over time.

Activity 12 Record Evidence Like a Scientist: Disappearing Sandcastles

Disappearing Sandcastles

Now, you will use your new Ideas about disappearing sandcastles to write a scientific explanation that answers the Can You Explain?



Content

Question:

How do wind, water, and weather change the Earth's surface?

My Claim:

Evidence:

Scientific Explanation with Reasoning:

Exercises on Lessons 4 and 5

1 Choose the correct answer:

- 1 _____ is the moving of sand or rocks to another place.
a. Weathering b. Erosion c. Deposition d. Decomposition
- 2 The force of _____ pulls rocks from the top of the mountain to its bottom.
a. river water b. seawater c. rainwater d. gravity
- 3 _____ erode(s) rocks and soil from their banks.
a. Rivers b. Waves c. Rainwater d. Gravity
- 4 When a river carrying sediments meets a sea, _____ is formed.
a. canyon b. sand dune c. delta d. snow
- 5 _____ is a process of settling rocks after moving to a new place.
a. Weathering b. Erosion c. Deposition d. Evaporation
- 6 Weathered rocks can be eroded by all the following factors, except _____.
a. gravity b. water c. sunlight d. wind
- 7 A gentle wind can form _____.
a. a delta b. small sand dunes
c. large sand dunes d. a mountain
- 8 _____ occurs when eroded sediments stop moving and begin to build up.
a. Deposition b. Erosion c. Weathering d. Photosynthesis
- 9 Wind can create a hill of sand called _____.
a. delta b. a canyon c. a valley d. a sand dune
- 10 Gentle wind can carry sand grains for _____ distance.
a. short b. long c. huge d. very long

Put (✓) or (X):

- 1 The gravitational force can cause erosion of the rocks. ()
- 2 Sometimes you can see erosion happening. ()
- 3 As the wind becomes stronger, it carries the sand grains for a shorter distance. ()
- 4 After weathering, small rock particles pile up and aren't moved from their place. ()
- 5 Sediments are deposited where they are eroded and picked up. ()
- 6 Blowing sand grains from one place to another by wind is called deposition. ()
- 7 A delta is a rectangular-shaped mass of sediment formed when a river meets the sea. ()
- 8 Pulling sand from seashores by sea waves is called erosion. ()
- 9 The deposition process never changes the shape of the Earth's surface. ()
- 10 The formation of sand dunes in the Eastern Desert in Egypt is due to the movement of winds. ()
- 11 Floods are one of the factors that cause water erosion. ()
- 12 The erosion process is usually followed by the weathering process. ()

Write the scientific term:

- 1 It is the process that occurs when soil is moved from one place to another. ()
- 2 It is an eroding factor that pulls the rocks down mountainsides. ()
- 3 It is an eroding factor that moves rocks from their banks downstream. ()
- 4 It is the process that lays sand down when the wind stops blowing. ()
- 5 It is a landform of deposited sediments formed when a river meets a sea. ()

4 Complete the following using the words between the brackets
(water - Nile Delta - hurricane - deposition - gentle wind -
Egyptian western desert)

- 1 A _____ forms a small sand dune, while a _____ forms large sand dunes like that in _____.
- 2 _____ is a fan-shaped mass of mud and sediments.
- 3 Wind, _____ and gravity are natural factors that control erosion process.
- 4 The process of laying down of sediment after its erosion is called _____.

5 Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 Rain	a. erodes rocks from their banks downstream.
2 Gravity	b. pulls rocks down mountainsides.
3 Rivers	c. washes soil in a hilly farmland.

1 _____ 2 _____ 3 _____

6 Mention the process from these words:

(Weathering - Erosion - Deposition)

Case	Process
1 Acid rain fall on rocks.	
2 The wind stops blowing	
3 The formation of sand dunes	
4 Hurricanes and floods	
5 Formation of the delta	
6 Pulling sand from the beach	

Give reasons for:

1 Gravity is one of the eroding factors.

2 The formation of sand dunes.

3 Erosion and deposition are linked processes.

What happens if?

1 Rain falls on hilly farmland?

2 The wind stops blowing? (Concerning the process happening to sand)

3 River water settles some sediments at the meeting point with the sea?

Model Exams

on Concept

Model Exam / 1

Question 1

(A) Choose the correct answer:

- 1 Steep valleys formed due to flowing water erosion are called
a. hills b. sand dunes c. canyons d. deltas
- 2 All the following are processes that change the Earth's surface,
a. erosion b. digestion c. weathering d. deposition
- 3 A canyon may take to be formed.
a. minutes b. hours c. days d. years
- 4 Plant play an important role in the mechanical weathering process.
a. leaves b. stems c. roots d. flowers

(B) What happens if? Oxygen gas reacts with iron found in rocks?

Question 2

(A) Put (✓) or (X):

- 1 Water may cause chemical or mechanical weathering. ()
- 2 The deposition process takes place before the erosion process. ()
- 3 Pulling sand from seashores by sea waves is called erosion. ()
- 4 Earth's surface changes from time to time. ()

(B) Give a reason for: Formation of a red-rust layer on some rocks.

Question 3

(A) complete the following using the words between the brackets
(expands - rocks - Limestone caves - weathering)

- 1 Sand is formed due to the breaking down of
- 2 are formed due to the combination of dissolved minerals.
- 3 Shaping of the Earth's surface begins with the process.
- 4 When water turns into ice, it and its volume increases.

(B) Write the scientific term:

They are tiny plant-like organisms that produce acids on rocks as they grow.

Model Exam / 2

Question 1
(A) Choose the correct answer:

1. All of the following are reasons for the chemical weathering, except
a. water b. plant roots c. acid rain d. oxygen gas

2. The force of _____ pulls rocks from the top of the mountain to its bottom
a. river water b. seawater c. rainwater d. gravity

3. A gentle wind can carry sand grains for _____ distances
a. short b. long c. huge d. very long

4. Weathered rocks can be eroded by all the following factors, except
a. gravity b. water c. sunlight d. wind

(B) Write the scientific term:

The process of moving weathered rocks from one place to another. (_____)

Question 2
(A) Put (✓) or (X):

1. Plant roots help in the formation of rocks. ()

2. The formation of sand dunes in deserts is due to the movement of water. ()

3. The deposition process never changes the shape of the Earth's surface. ()

4. Rivers erode rocks from their banks downstream. ()

(B) Cross out the odd word:

Erosion - Weathering - Deposition - Digestion (_____)

Question 3

(A) Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 Delta	a. breaks rocks down without changing their matter.
2 Mechanical weathering	b. changes the composition of the rocks.
3 Chemical weathering	c. is a process of settling rocks after moving to new place.
4 Deposition	d. is a landform of deposited sediments when a river meets the sea.

(B) What happens if? Acid rain falls on rocks?



Concept

2

Changing Landscape

Concept Objectives:

By the end of this concept:

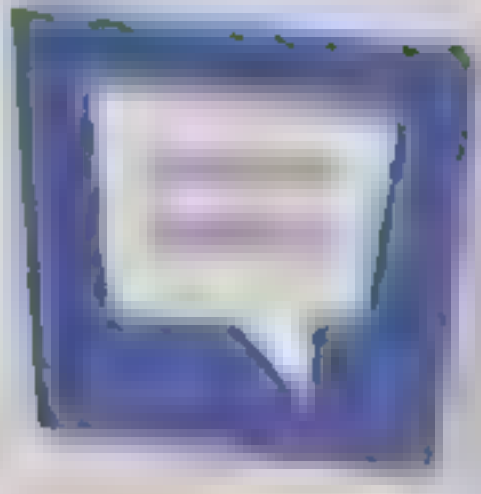
- ▶ Students can ask questions about the causes and stability of landforms that change slowly and quickly.
- ▶ Students can provide evidence that weathering and erosion by wind, water, and ice cause changes on the Earth's surface over time.
- ▶ Students can develop a model that describes patterns in the formation of deltas and predicts where deltas are likely to form.
- ▶ Students can describe the interactions between water and landforms in a watershed and between wind and sand dunes at the beach.
- ▶ Students can use evidence from patterns in rock formations to explain the changes in the Earth's surface over time.

Key Vocabulary

- Canyon
- Delta
- Dune

Lesson

1



Activity



Can You Explain?



Many factors can change the Earth's surface and form new landforms, such as canyons.

العوامل من التغيير سطح الأرض وتكوين تضاريس جديدة.



How are canyons formed ?



- A canyon is a landform that can be formed in many ways, including weathering and erosion by wind, water, and other factors.
- Canyons can take millions of years to be formed.

القنوات من التضاريس التي يمكن أن تتكوّن بعدة طرق، منها: التجوية والتعرية بفعل الرياح والمياه وغيرها من العوامل.

يستغرق تكوّن الأخاديد ملايين السنين.

Activity 2 Canyons

When the water is moving over the sand,
it pushes some of the sand out of the way.
As the water moves the sand,
it leaves an impression of where the water flowed.



Experiment 2

• عندما يجري الماء على التراب، فإنه يدفع بعض هذا التراب من مكانه. • أثناء دفع الماء للتراب، فإنه يترك أثراً بمكان تدفقه.

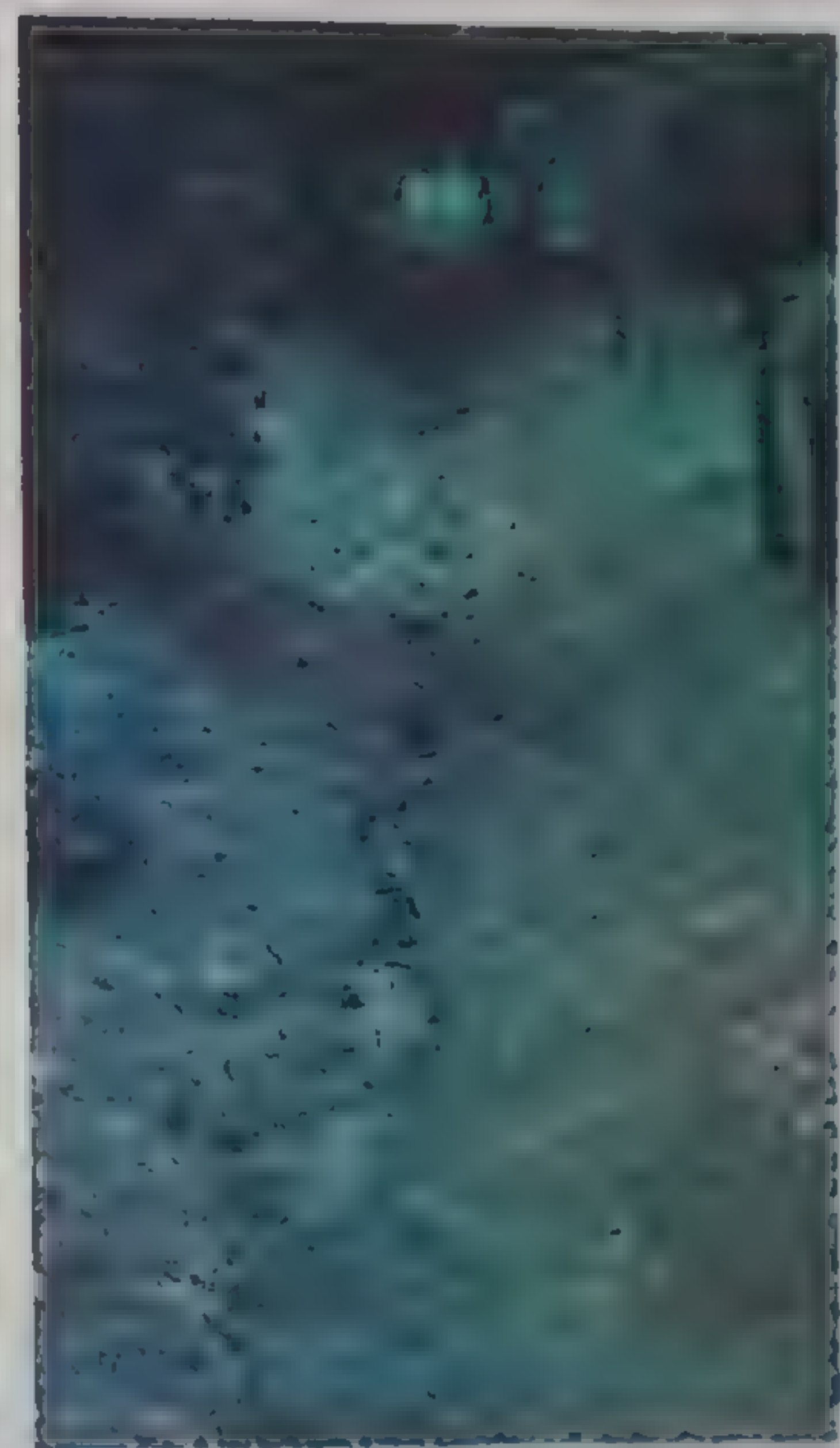
How can understanding the formation of landforms help predict future change?

Scientists look for clues in nature to know how landforms were formed.

Observe the opposite figure that represents a small canyon, then answer:

How does the small canyon formed?

• A stream of water may have formed it.



What is your evidence?

- There are trees and other plants on both sides that need water to grow.
- The sides are gently sloped as water helps wear the sides down.

What happens if? It rained a lot in a small canyon?

• The small canyon becomes deeper.

• يبحث العلماء عن أدلة لتحديد أسباب تكون تضاريس سطح الأرض.

• كيف تكون الأخدود الصغير؟ - تكون الأخدود نتيجة لمجرى مائي.

• ما هي الأدلة على تكون الأخاديد بفعل المجاري المائية؟

- وجود أشجار ونباتات على جانبي الأخدود تحتاج إلى الماء لتنمو. - جوانب الأخدود منحدرية حيث تسببت المياه في تأكلها.

• إذا زادت الأمطار والمياه الجارية سيتسبب ذلك في زيادة عمق الأخدود الصغير.

Observe the following figures, then put (✓) or (X):

Unit 4



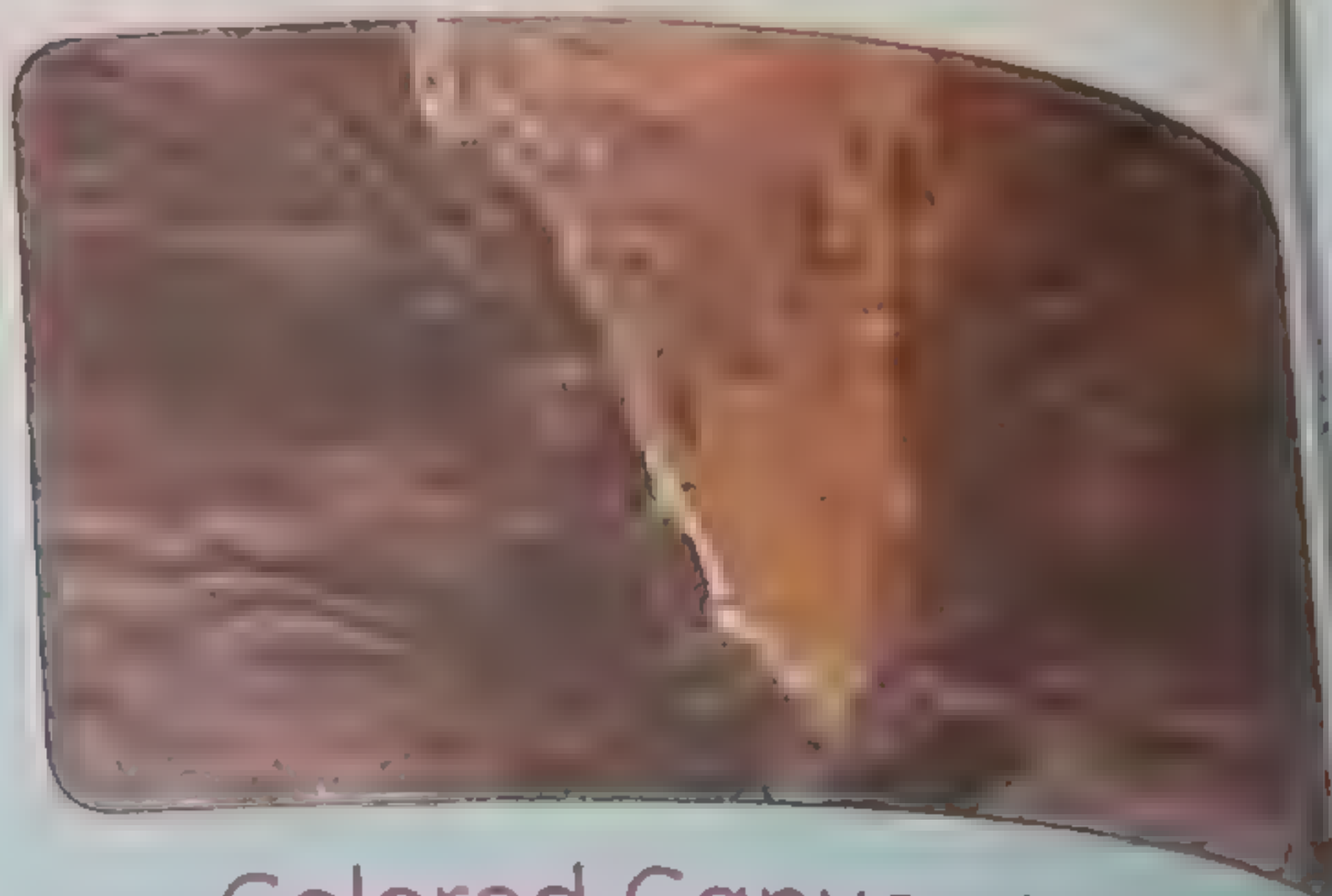
Small Canyon in Thailand



Wadi Nakhr in Oman



Wadi Rum in Jordan



Colored Canyon in Sinai

- 1) All canyons have the same shape and color. ()
- 2) Wadi Nakhr canyon has a reddish color. ()
- 3) The colored canyon is V-shaped. ()
- 4) All these landforms take a short period of time to be formed. ()

You can revise your answers from the following table that explain the similarities and differences between them:

Landform	In	Color	V-Shaped
Wadi Nakhr	Oman	Brown and Black	
Small Canyons	Thailand	Reddish	
Wadi Rum	Jordan	Reddish	✓
Colored Canyon	Sinai in Egypt	Reddish	✓

Examples of some landforms:



Canyon
أخدود



Valley
وادي



Mountains
جبال



Sand Dunes
كثبان رملية

Check your understanding?

Put (✓) or (X):

- 1 Most canyons are formed by the effect of flowing water. ()
- 2 The shape of the sand doesn't change when water flows over them. ()
- 3 Colored Canyon has black and brown colors. ()
- 4 Small canyons would get deeper if water ran through them again. ()

Exercises on Lesson 1

1 Choose the correct answer:

- 1 A canyon may take _____ of years to be formed.
a. hundreds b. tens c. millions d. couple
- 2 All the following are examples of landforms found on the Earth's surface, except _____.
a. canyons b. dunes c. buildings d. mountains
- 3 Canyons can be formed in many ways, including _____.
a. weathering only b. erosion only
c. weathering and erosion d. erosion and deposition
- 4 If the rain falls over a canyon for several times per year, _____.
a. its depth increases b. its depth decreases
c. it becomes flat d. not be affected
- 5 On flowing water from a stream over flat land, a _____ may be formed.
a. large canyon b. small canyon c. hill d. sand dune
- 6 Reddish small canyons found in _____.
a. Egypt b. Oman c. Jordan d. Thailand

2 Put (✓) or (X):

- 1 Valleys, canyons, and mountains are different landforms. ()
- 2 Wadi Rum in Jordan is an example of a sand dune. ()
- 3 A canyon may be formed by the effect of water only. ()
- 4 All canyons have the same shape and color. ()
- 5 The sides of the canyon at the beginning of its formation are gently-sloped. ()

Write the scientific term:

- 1. A deep valley formed due to the weathering and erosion of wind and water. (.....)
- 2. A canyon whose rocks have black and brown colors. (.....)
- 3. A canyon that has a V-shaped in Egypt. (.....)

Complete the following using the words between the brackets:

(small canyon - impression - V-shaped - water stream - brown and black colored)

- 1. When the rain falls on a flat sandy land, it will leave an
- 2. Wadi-Nakhr is canyon.
- 3. Wadi Rum and colored canyon in Sinai are canyons.
- 4. In the beginning of a formation, plants and trees grow at the two sides of it due to the effect of a

Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 Small canyon	a. is a black and brown canyon in Oman.
2 Wadi Rum	b. is a V-shaped canyon in Jordan.
3 Wadi Nakhr	c. is a reddish canyon in Thailand.
1	2
2	3

Cross out the odd word:

- 1. Mountain - Valley - Gravity - Canyon (.....)

7

Study the following figure, then complete the following sentences:



- 1 This figure represents a _____ that is formed in _____ of years.
- 2 _____ and _____ processes help in its formation.

8

Give reasons for:

- 1 Some small canyons have plants and trees on their sides.

- 2 Canyons all over the world have different properties.

9

What happens if?



- 1 A water stream flows over a flat land?

- 2 A lot of rain falls on a small canyon?

Activity 3 Hands-on Investigation: Landscapes in Your Environment

Put (✓) or (X):

- 1 Sometimes we can see erosion happening. ()
- 2 Weathering and erosion are rapid processes. ()

On a rainy day, you can see some changes in the landscape around you on the street.



You can see the broken bricks and rocks due to the growth of roots.

You can see cracks in the road.

You can see a patch of mud.

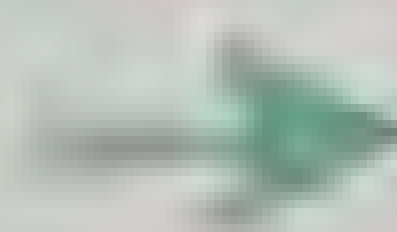
Shifting Surfaces

You can see the same processes happen in large landscapes in nature where:

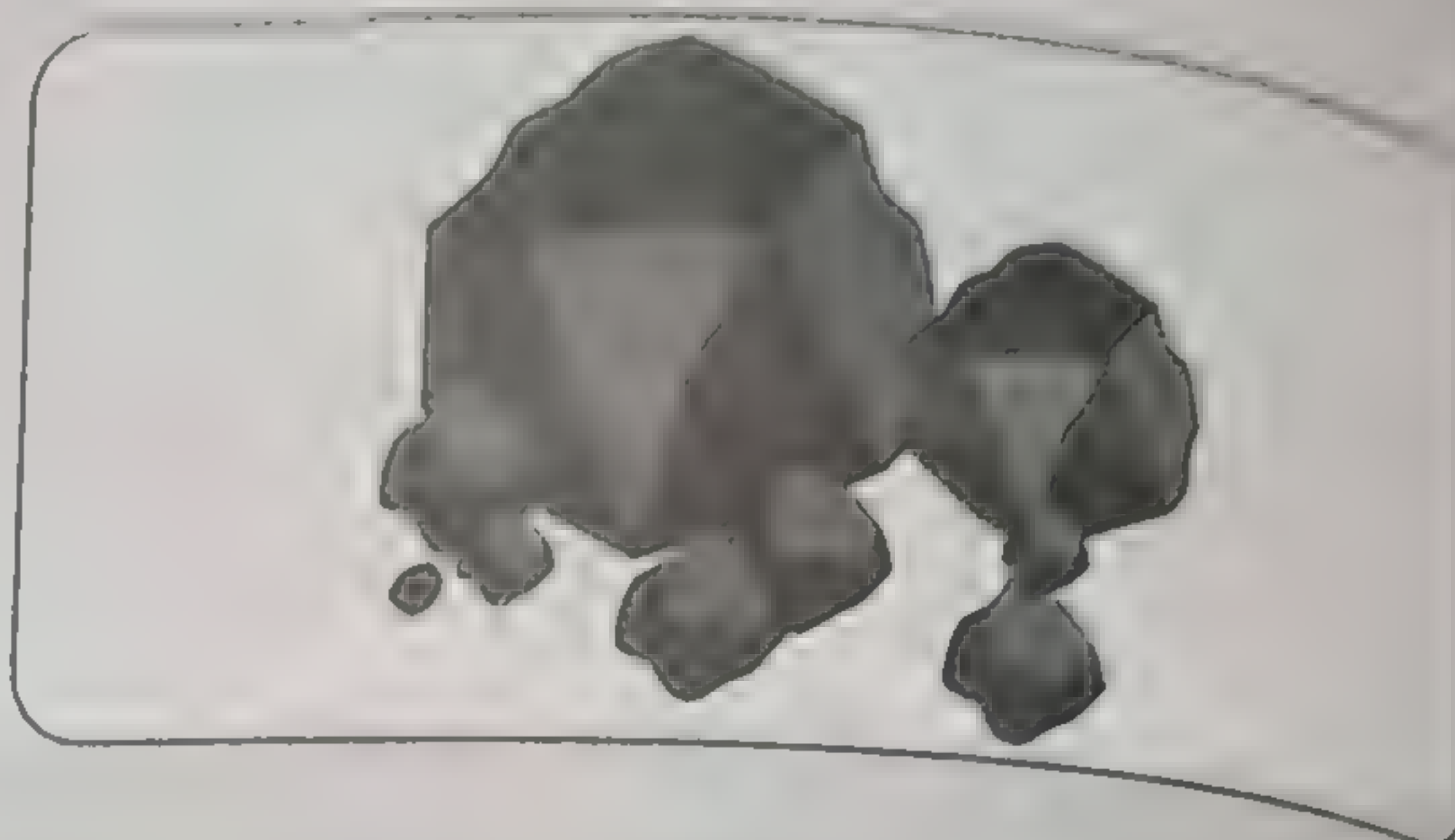


Weathering process:

Instead of broken bricks and rocks due to the growth of roots,



you can see a rounded, worn rock.



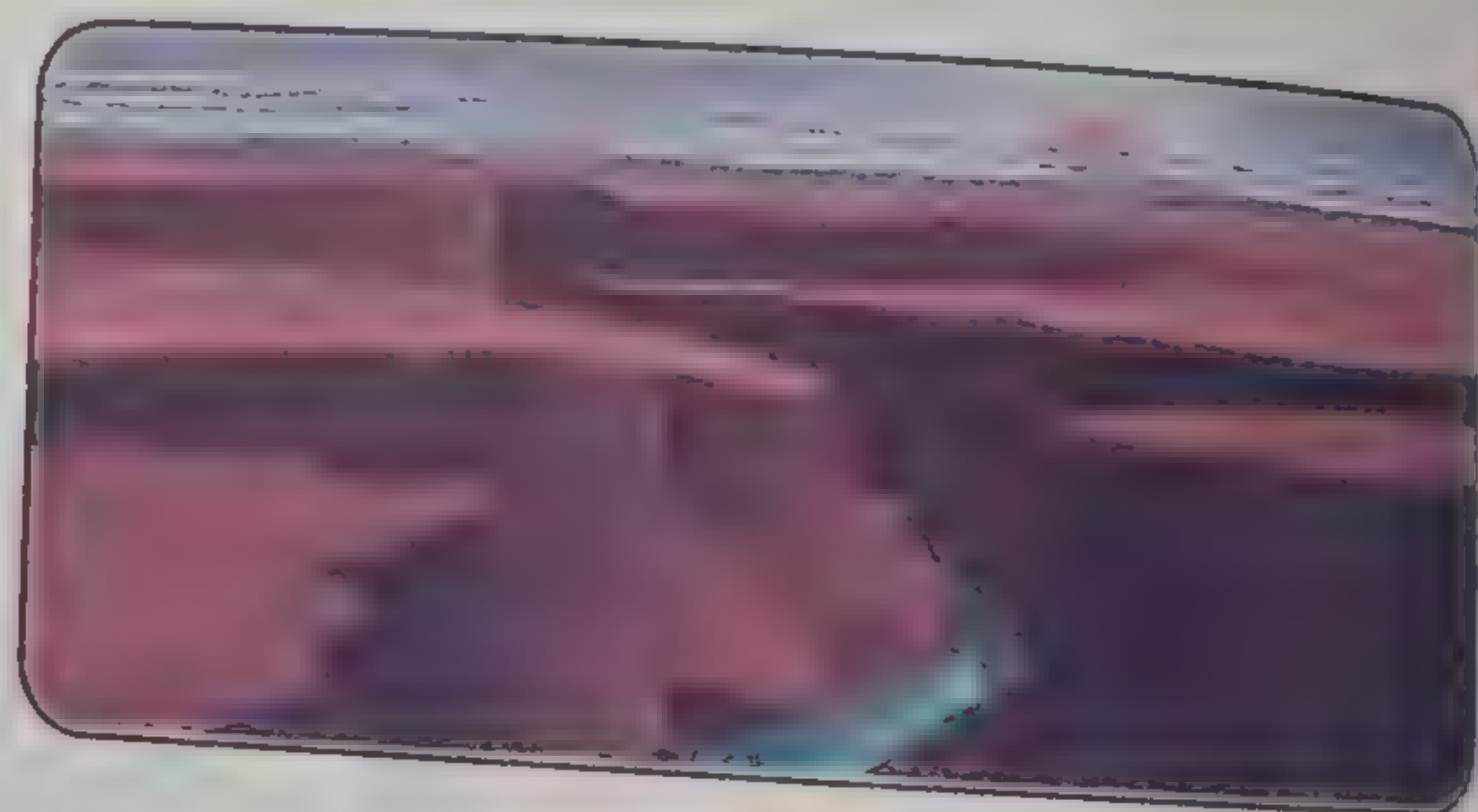
2

Erosion process:

Instead of cracks in the road,



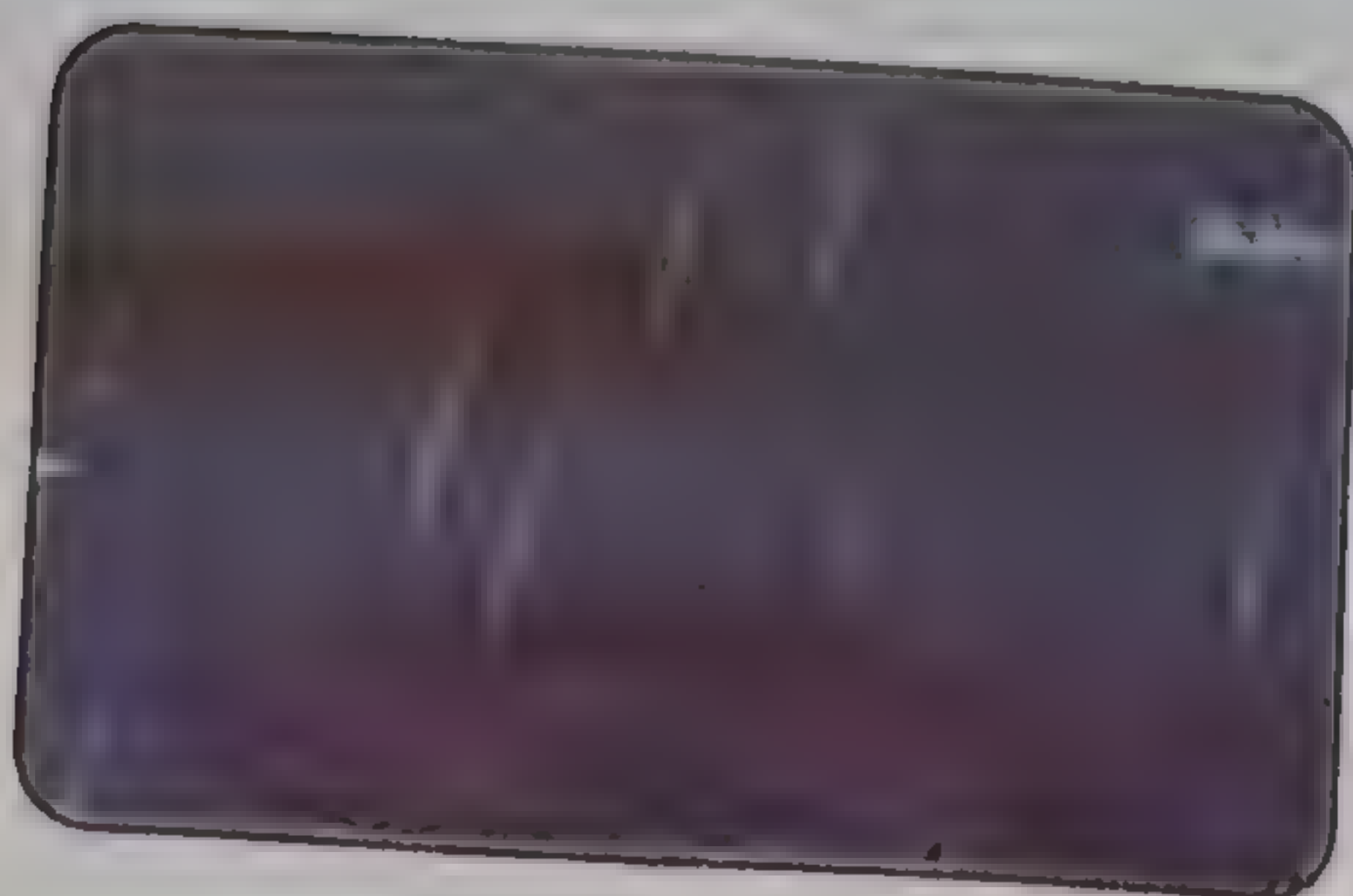
you can see the walls of the canyon were eroding due to the effect of water.



3

Deposition process:

Instead of a patch of mud,



you can see a river making new landforms, such as a delta.



Give a reason for... ?

Recognizing signs of weathering, erosion, and deposition is very useful. Because it helps us build houses in safe places, where:

People must not build a house on a hill that is eroding.



People must not build a house very close to a river. **GR**

Because the river path may change, it may cause erosion and the deposition of houses.



Check your understanding?

» Put (✓) or (X):

- 1 When water falls on a small canyon, it could become deeper. ()
- 2 People must build a house close to a river. ()
- 3 A patch of mud in a street on a rainy day represents deposition. ()
- 4 A canyon can be formed by long eroding by water. ()

» Complete:

- 1 Rocks get broken down by, and moved through and dropped, somewhere else through
- 2 When water falls on sand, it leaves an

Exercises on Lesson 2

1 Choose the correct answer:

- 1 The shape of a rock gets worn and rounded by the effect of process.
a. weathering
b. deposition
c. erosion
d. photosynthesis
- 2 _____ is/are evidence of deposition.
a. A rounded, worn rock
b. A patch of sand on the ground
c. An area with canyons
d. Red-colored rocks
- 3 A running water stream can transport small rocks by _____ process.
a. chemical weathering
b. erosion
c. deposition
d. mechanical weathering
- 4 A river may make a new _____ at its end through the _____ process.
a. mountain, deposition
b. canyon, erosion
c. land, deposition
d. land, weathering

2 Put (✓) or (X):

- 1 When you find a worn rock, it's evidence of erosion. ()
- 2 Understanding the formation of landforms helps predict future changes in landforms. ()
- 3 It is better to build your house on a hill that is eroded. ()
- 4 A river may create a delta from sediments by deposition. ()
- 5 Deposition is one of the processes that change the Earth's surface. ()
- 6 A river never changes its path, so it's safe to build a house near a river. ()

Complete the following using the words between the brackets:
(erosion - many years - deposition - Weathering)

causes mountain rocks to break off.

An area with small canyons where soil was washed away after heavy rain is evidence of _____.

Sediments can create a new land over long time by _____.

The deposition process carried out by a river takes _____.

Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 A rounded, worn rock	a. is evidence of deposition.
2 An area with small canyons	b. is evidence of erosion.
3 A patch of sand on ground	c. is evidence of weathering.
1 _____ 2 _____ 3 _____	

Give reasons for:

1 It is useful to recognize signs of weathering, erosion, and deposition.

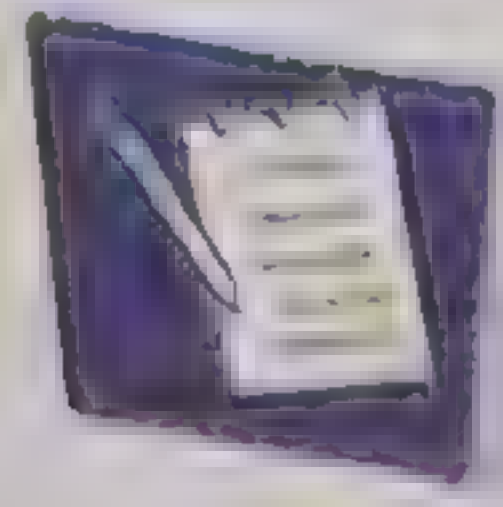
2 It is not safe to build a house close to a river.

What happens if?

1 A house is built close to a river?

Lesson

3



Activity

4 Canyon Formation



» Many valleys, including canyons, are formed in the same way.

Stages of valley formation

- 1 Gravity pulls rainwater downhill, forming small streams.
- 2 Small streams are joined together to form bigger streams (rivers).
- 3 The water of the river moves fast and erodes (carves out) rocks in its pathway.
- 4 When a river dries after a very long time, a new landform may be formed.

مراحل تكوين الوديان:

- 1 تعمل الجاذبية على سحب مياه الأمطار على طول المنحدر مُكوّنة جداول صغيرة.
- 2 تتجمع الجداول الصغيرة مُكوّنة جداول أكبر (نهر).
- 3 تندفع مياه النهر بسرعة وتقوم بتكسير (نحت) الصخور الموجودة في مسار النهر.
- 4 عندما يجف النهر بعد فترة طويلة جدًا، فإنه قد يكون مظهر سطح جديد.

Factors affect the shape of the valley

- 1 The types of rocks
- 2 Speed of the river
- 3 Age of the river
- 4 Size of the river



NOTES:

- Big streams or rivers cause more erosion than small streams.
- Fast-moving water causes more erosion than slow-moving water.

Canyons

They are special types of valleys with steep sides.

الأخاديد: هي نوع خاص من الوديان تتميز بجوانبها المنحدرة.

Concept 2

They are exciting geologic landforms.

People travel from all over the world to see and visit them.

A canyon is a landform that can be formed in many ways, including **weathering** and **erosion** by wind, water, and other factors.

The Grand Canyon

United States of America

It is millions of years old.

- It is very large and steep.
- It contains many layers of rocks.
- There is a river at the bottom.



• يعتبر أكبر أخدود في العالم.

• يقع في: الولايات المتحدة الأمريكية.

• عمره: يعود تكوينه إلى ملايين السنين.

• الوصف (الشكل):

– أخدود كبير وعميق جدًا.

– يتكوّن من العديد من الطبقات الصخرية.

– هناك نهر يجري في أسفله.

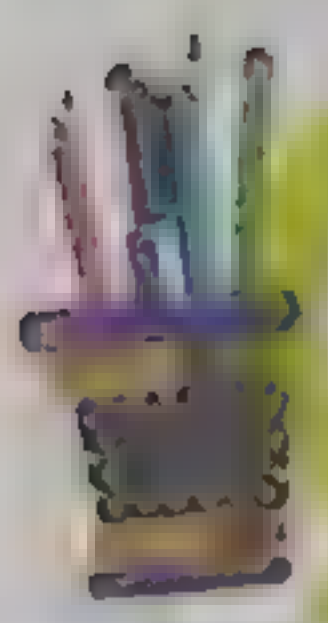
Formation of the Grand Canyon



- 1 Over millions of years ago, the water of the river was moving so quickly down a steep slope.
- 2 The force of this rushing water eroded a lot of sediment and carried it away.
- 3 This process took many millions of years and leads to the formation of the **Grand Canyon**.

كيف تكوّن الأخدود العظيم؟

- 1 منذ ملايين السنين كانت مياه النهر تتحرك بسرعة كبيرة أسفل منحدر شديد الانحدار.
- 2 أدت قوة هذه المياه المتدفقة إلى تآكل الكثير من الرواسب وحملت المياه بعيداً.
- 3 استغرقت هذه العملية ملايين السنين؛ مما أدى إلى تكوين الأخدود العظيم.





Check your understanding?

» Put (✓) or (X):

- 1 The bigger the stream, the more erosion it causes. ()
- 2 Rivers erode rocks and can form valleys and canyons. ()
- 3 The canyon walls are not very tall and have a gentle slope. ()
- 4 A canyon is a type of valley. ()
- 5 Rivers can change landform very slowly. ()
- 6 Fast-moving rivers can cause a lot of erosion. ()

Activity 5 Canyon and Valleys

We have learned that canyons are a special type of valley.
Let's study the similarities and differences between canyons and valleys.

POC	Valley	Canyon
Figure		
Definition	<ul style="list-style-type: none"> Valleys are lowland areas between mountains. 	<ul style="list-style-type: none"> Canyons are special types of valleys with steep sides.
Differences	<ul style="list-style-type: none"> The sides are gently sloped. They are surrounded by a wide, flat plain. 	<ul style="list-style-type: none"> The sides are steep. They are surrounded by narrow and vertical walls. They usually consist of many layers.
Similarities	<ul style="list-style-type: none"> They are formed by rivers or streams. They often have rivers or streams flow in the bottom. 	



Check your understanding?

Put (✓) or (X):

- Canyons are a special type of valley with gently sloped sides. ()
- The walls of valley are vertical and narrow. ()

Exercises on Lesson 3

1 Choose the correct answer:

- 1 _____ pulls rainwater downhill, forming small streams.
 a. Magnetism b. Gravity c. Sunlight d. Wind
- 2 _____ can cause more erosion.
 a. A small stream b. A slow-moving river
 c. A big river d. A river moving on a flat land
- 3 When a river flows over a surface and carves out it, a _____ is formed.
 a. canyon b. delta c. hill d. mountain
- 4 The movement of sediments down a fast-moving river is considered
 a. weathering b. erosion c. deposition d. rusting
- 5 All the following factors affect the shape of the valley, except
 a. the river's size b. the river's speed
 c. the rocks' type d. the rocks' color
- 6 A canyon and a valley are common in having
 a. gently sloped sides b. rivers at the bottom
 c. steep sides d. vertical walls
- 7 A _____ is a deep valley with high, steep sides.
 a. hill b. mountain c. canyon d. dune
- 8 _____ are lowland areas with gently-sloped sides.
 a. Valleys b. Deltas c. Canyons d. Dunes
- 9 A flowing river may form
 a. a valley b. a canyon c. a dune d. a and b

2 Put (✓) or (X):

- 1 When a river moves down a steep slope, its speed decreases.
- 2 A canyon is a type of valley with steep sides.

- 1 A river can erode a mountain in a short period of time. ()
- 2 The Grand Canyon took millions of years to be created. ()
- 3 The Grand Canyon has a river at its bottom. ()
- 4 Canyon walls are not very tall and have gentle slopes. ()
- 5 A valley has high and steep walls with many layers of rocks. ()
- 6 Both canyons and valleys often have rivers at their bottoms. ()
- 7 Most valleys are formed due to the erosion of many sediments and their transfer far away. ()
- 8 The shape of the valley depends on the type of rock. ()
- 9 A slow-moving river has high energy, so it causes more erosion. ()

Write the scientific term:

- 1 A force pulls rainwater downhill, forming small streams. ()
- 2 A special type of valley with steep sides. ()
- 3 The world's largest canyon, located in the USA. ()
- 4 They are often found at the bottom of both canyons and valleys. ()

Complete the following using the words between the brackets:

(less - high - more - gravity - increases - sediments - many layers)

- 1 Rainwater is pulled downhill, forming small stream due to _____.
- 2 When the water of a river moves downhill a steep slope, the water speed _____ that causes _____ erosion.
- 3 A small stream causes _____ erosion than a large river.
- 4 The force of rushing water erodes a lot of _____ of a mountain and carried them away.
- 5 Walls of canyons are very _____ and composes of _____.

5 Study the following figure, then put (✓) or (x):



Figure (A)

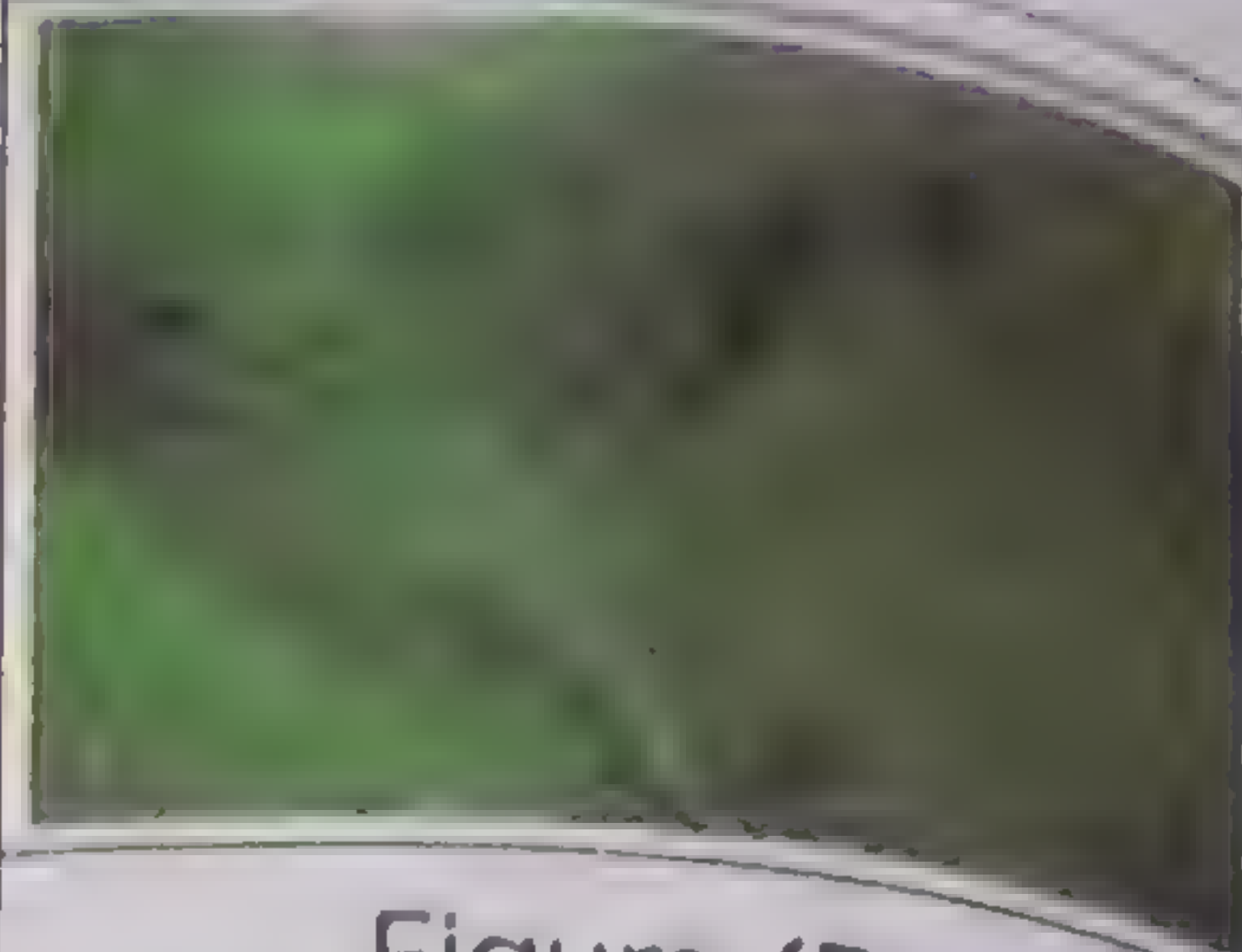


Figure (B)

- 1 The landform in figure (A) has gently-sloped sides.
- 2 The landform in figure (B) may surround some plains between mountains.
- 3 Both landforms are formed due to erosion carried by rivers.
- 4 The walls of the landform in figure (A) are higher than those in figure (B).

6 Give reasons for:

- 1 Valleys and canyons are formed in the same way.

- 2 Rainwater is pulled downhill after falling on a mountain.

7 What happens if?

- 1 A river erodes the sediments of a mountain over a long period of time.
- 2 The water of a river moves downhill on a steep slope?
- 3 Small streams of water join together? (Concerning erosion)

Lesson 4

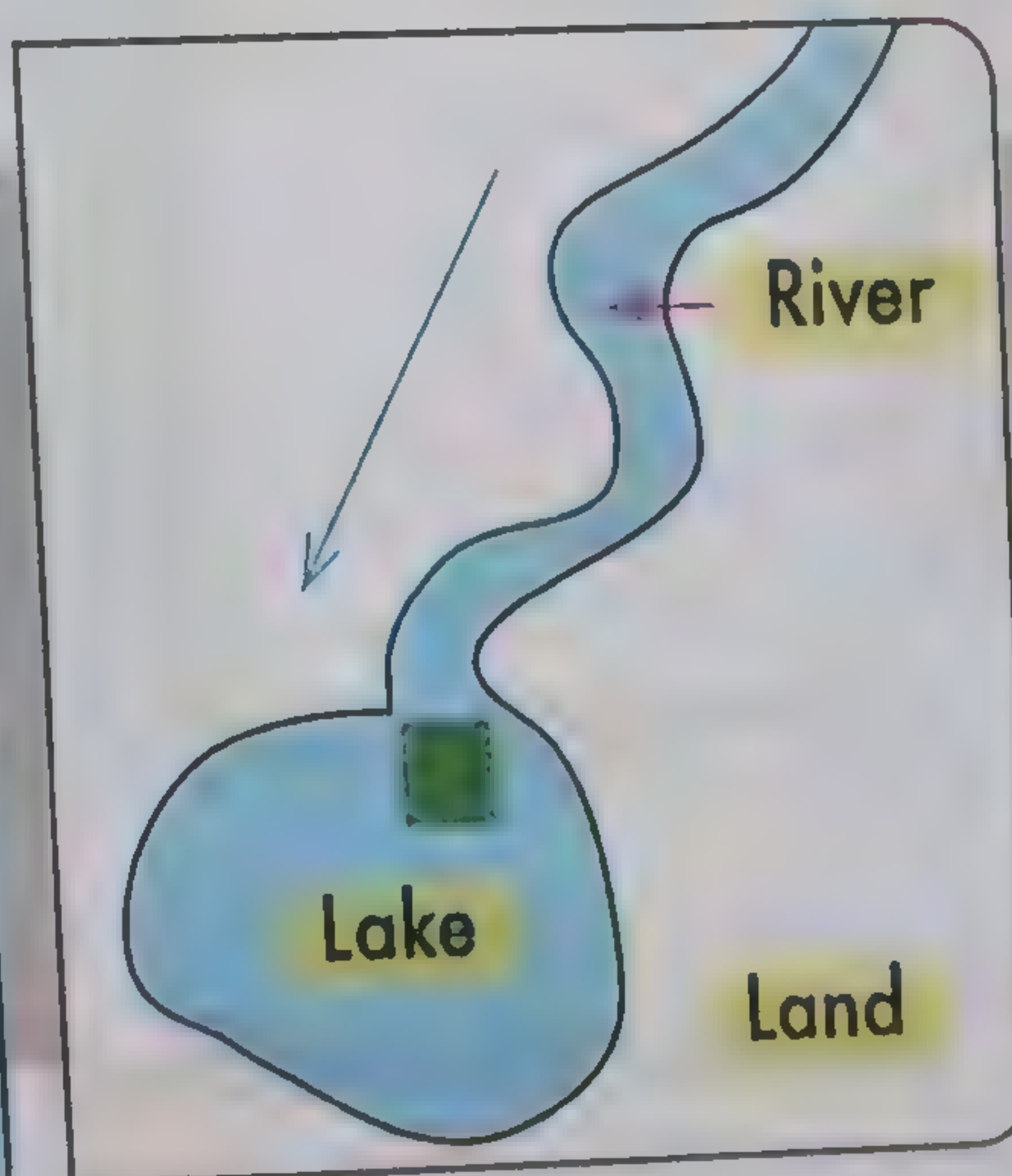
Activity 6 Delta Formation

Unlike valleys and canyons, deltas are not formed by erosion, but they are formed by **deposition**.

على عكس الوديان والأودية، لا تتشكل الدلتا عن طريق عملية التعرية، ولكنها تتشكل عن طريق عملية الترسيب.

How is delta formed?

- 1 Fast-moving rivers carry sediments called **silt**.
- 2 The water of the river is full of sediment that has been collected along the journey.
- 3 When the **rapid flowing water** "of the river" enters **still water** "lake", or **slower water** "ocean or sea", water loses energy and drops the sediment that it is carrying forming a **delta**.



Silt is made up of very fine bits of sand, clay, or rock materials.

كيف تكوّن الدلتا؟

- 1 تحمل المياه السريعة للأنهار رواسب تُسمى الطمي.
- 2 تكون مياه النهر مليئة بالرواسب التي جمعتها أثناء تلك الرحلة.
- 3 عند التقاء المياه السريعة (النهر) بالمياه الساكنة (بحيرة) أو مياه بطيئة (المحيط أو البحر) يتسبب ذلك في فقدان المياه لطاقتها؛ وبالتالي تترسب الرواسب التي تحملها مُكوّنة الدلتا.



The network of plants in the delta helps in increasing deposition.
Because plant's roots are responsible for slowing down the water.
في الدلتا هذه الأراضي في زيادة عملية الترسيب.
حركة المياه بشكل أكبر مما يزيد من عملية الترسيب.

The Nile River Delta

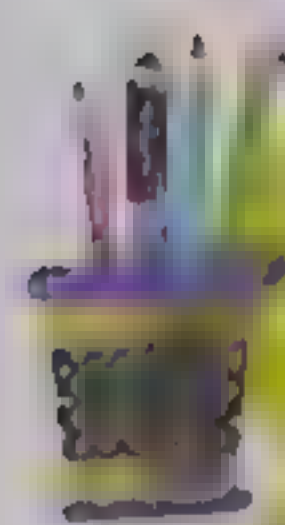
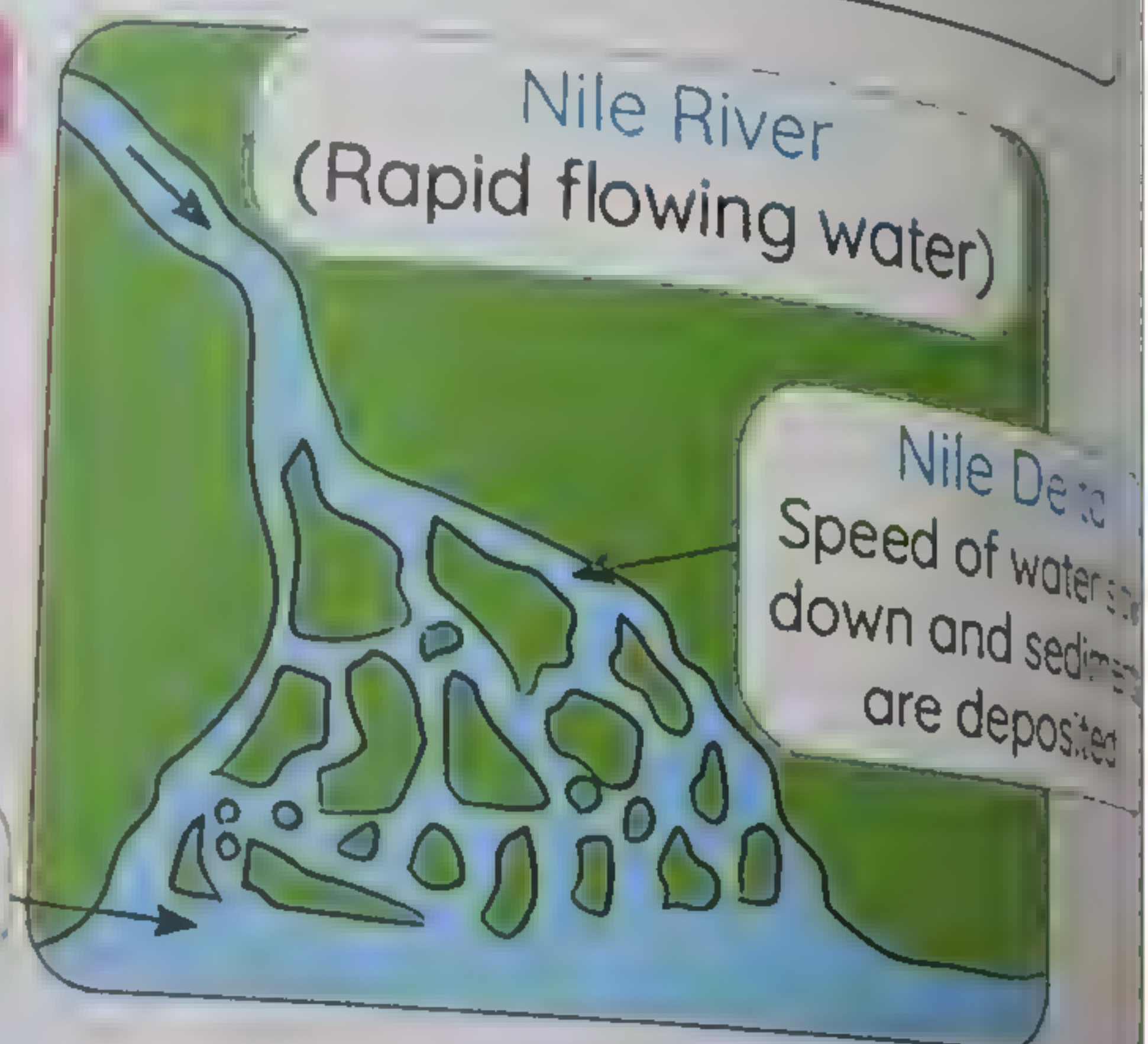
"The most famous delta in the world".

Shape	Triangular shape
Area	It covers over 20,000 km ² in Egypt
Location	Lies between Cairo and the northern coast of Egypt
Importance	It is characterized by the presence of fertile soil that allows the cultivation of different types of crops.

How the Nile River Delta is formed

The Nile River travels a distance of about 6,600 km to pour into the Mediterranean Sea, where it drops its sediments, forming the **Nile Delta**.

Mediterranean Sea
(Slow water)



Check your understanding?

Put (✓) or (X):

- 1 Canyons and deltas are landforms that were formed by the same process.
- 2 Farmers use the rich soil in the delta to grow many crops in Egypt.

Activity 7 Wind Erosion

The wind in the desert can be a powerful force for change.

تعد رياح الصحراء من القوى الأساسية في إحداث تغيير في مظاهر السطح.

Steps of Erosion by Wind

1 When wind blows across the land, it picks up sand and other rock particles and carries them along.

2 When this flying sediment hits a rock, it wears down that rock like a sandblaster.

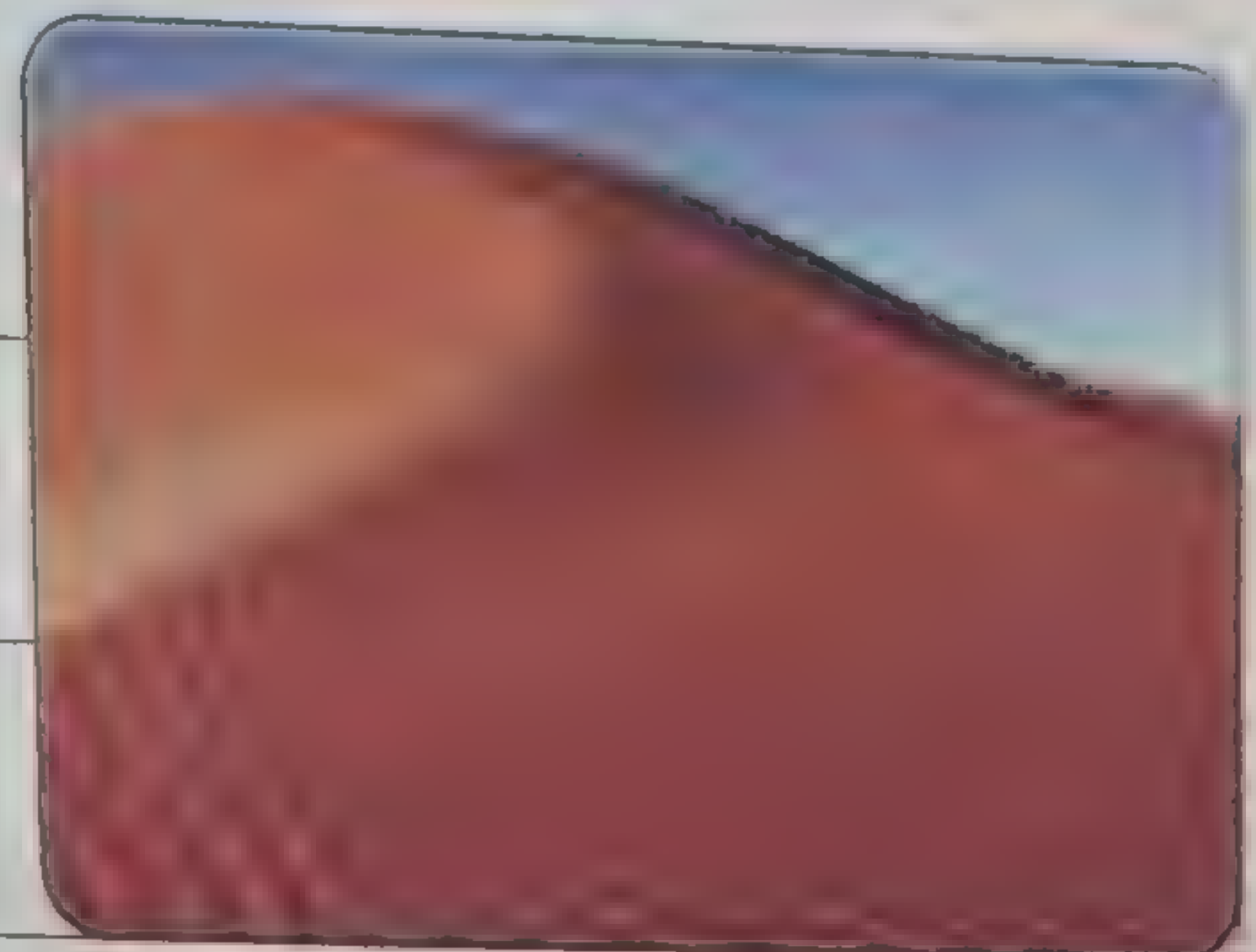
3 This process carves the rock into strange shapes.



خطوات حدوث عملية التعرية بفعل الرياح:

- 1 تحمل الرياح القريبة من سطح الأرض الرمال وجزيئات الصخور وتنقلها من مكانها لمكان آخر.
- 2 عند اصطدام هذه الرواسب المتطايرة بالصخور، فإنها تعمل على نحت هذه الصخور كما لو كانت آلة كشط.
- 3 تقوم تلك العملية بتحويل الصخور إلى أشكال غريبة.

Sand Dunes



Shape	A hill of sand
Location	Sandy desert or sandy beach.
Area	<ul style="list-style-type: none"> • They are found in groups. • They may cover a large area. (Hundreds of meters tall).
Process	Erosion and deposition.
Factors	Wind-blown sand
How they are formed?	Sand dunes are formed when a barrier like a rock blocks the wind-blown sand.

Sand Dunes Movements



» Dunes are interesting because they are constantly moving, as follows:

1 When wind blows across a dune, sand grains erode away from the side the wind is coming from.

2 The grains of sand are carried up by the wind along the slope of the dune.

3 When they reach the top, the dune forms a barrier to the wind. So, the sand grains roll down the other side.

1 عندما تهب الرياح عبر الكثبان الرملية، تتحرك حبيبات الرمال بعيداً عن الجانب الذي تأتي منه الرياح.

2 تحمل الرياح حبيبات الرمل على طول منحدر الكثبان الرملية.

3 عندما تصل حبيبات الرمال إلى القمة، تشكل الكثبان الرملية حاجزاً أمام الرياح؛ وبالتالي تتدحرج حبات الرمل لأسفل على الجانب الآخر.



Check your understanding?

» Put (✓) or (X):

1 Sand dunes are formed by the erosion process only. ()

2 Wind erosion can carve rocks in different shapes. ()

Activity 8 Hands-on Investigation: Sand Shifters

Wind and sand work together to erode rocks. When the wind stops blowing, sand and small rocks are deposited in a new place.

Concept 2

Experiment



In this experiment, you will create a model of sand dunes and study how they are moving.



Tools:

Aluminium foil pan	Sand	One rock	Straw

Steps:

- 1 Place a small rock on one side of the pan.
- 2 Put a suitable amount of sand on the other side of the pan.
- 3 Try to blow air on the sand using a straw.
- 4 Repeat the previous steps by changing the force and direction of the wind.

Observation:

» Sand moves by the force of the wind where,

- As the force of the wind becomes **weaker**, the sand moves for a **shorter** distance.
- As the force of the wind becomes **stronger**, the sand moves a **longer** distance.

» When we blow air in the same direction of the rock, the rock blocks the sand and collects it before the rock.

Conclusion:

» The dunes are often formed where something blocks the path of the sand, such as rock.

» The **distance** that the sand grains move depends on the **force** of the wind.

» The **way** the sand moves depends on the **direction** of the wind.



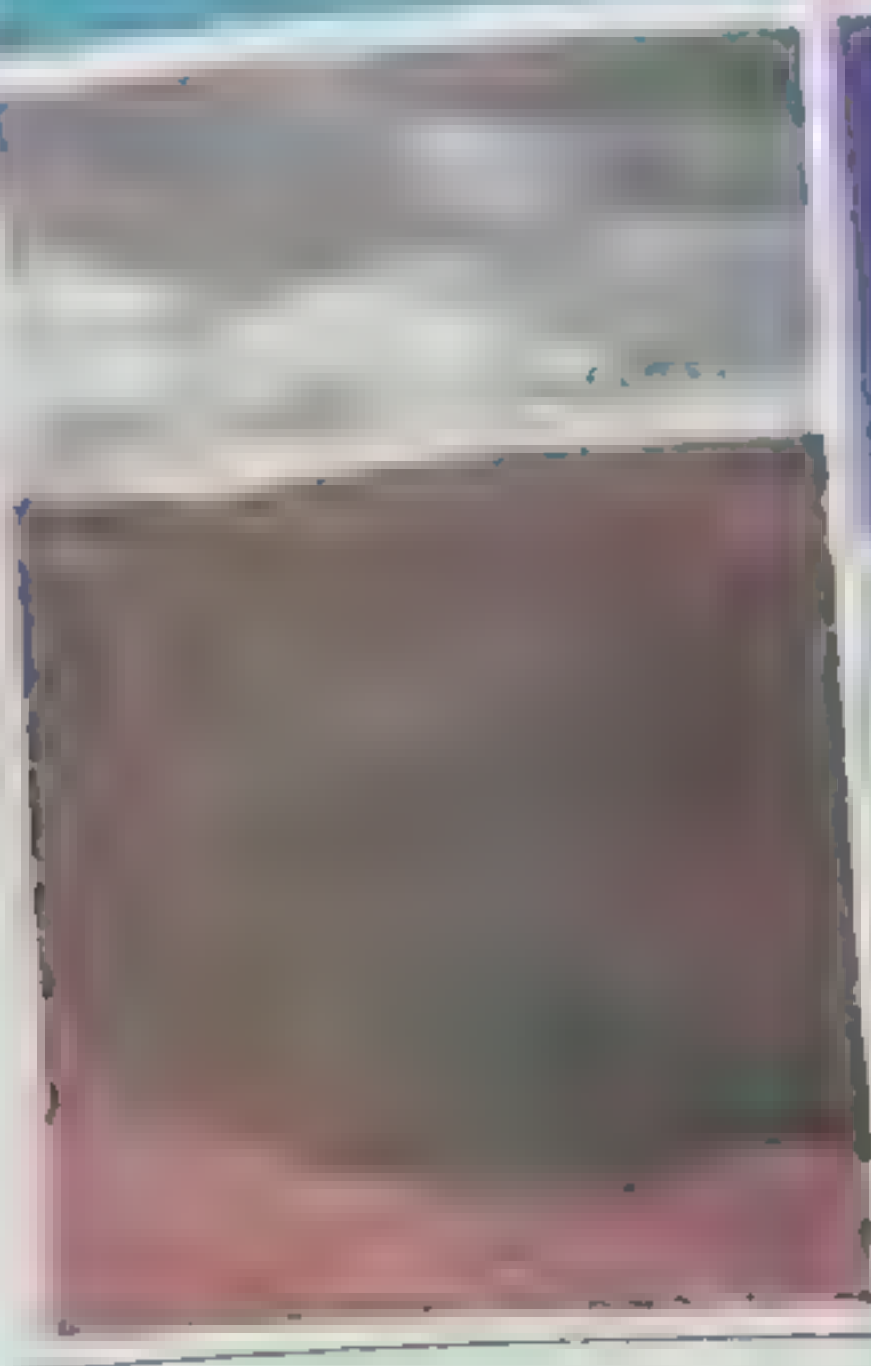


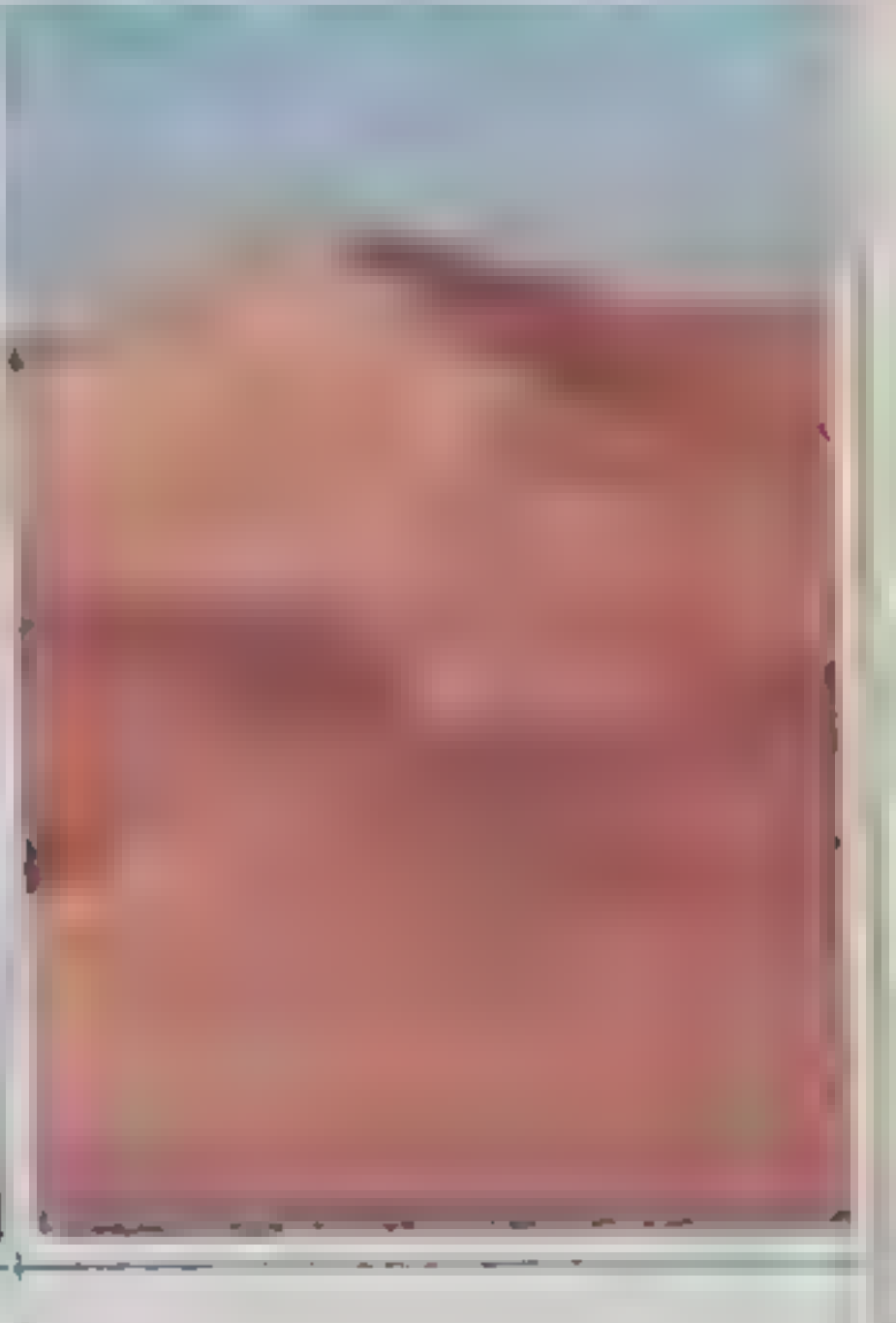
Check your understanding?

» Put (✓) or (X):

- 1 The distance moved by sand depends on the direction of the wind. ()
- 2 Sand dunes are in continuous motion due to the movement of the wind. ()

Activity 9 Describing Landforms

Examples of some landforms that were formed:

Figure	Canyons	Valleys	Deltas	Dunes
				
Definition	They are deep valleys with steep sides.	They are lowland areas between mountains that are usually surrounded by a wide, flat plain.	They are fan-shaped landforms formed when rivers enter oceans or seas.	They are hills made of sand.
The way of formation	Weathering and Erosion "Water or Wind"		Deposition "Water"	Erosion and deposition "Wind"

Erosion generally occurs "slowly", but in cases of storms or rockslides, the erosion process may occur rapidly.

التعرية تحدث عمومًا «ببطء»، ولكن في حالات العواصف أو الانزلاقات الصخرية قد تحدث عملية التعرية «بسرعة».

- Rivers cause the formation of valleys and canyons.
- Wind and sand work together as a force of erosion in the desert.

• الأنهار هي المسئولة عادةً عن تكوّن الوديان والأخاديد.
• تعمل الرياح والرمال معًا كقوى التعرية في الصحراء.

Exercises on Lessons 4 and 5

1 Choose the correct answer:

- 1 When a river meets a sea or an ocean, a landform known as a _____ is formed.
a. canyon b. volcano c. mountain d. delta
- 2 All the following are created by the water of rivers or streams, except _____.
a. _____ b. delta c. canyon d. sand dune
- 3 Silt carried by water contains all the following, except _____.
a. sand b. clay c. rocks d. glass
- 4 _____ is the main process responsible for the formation of deltas.
a. Deposition b. Erosion c. Weathering d. Photosynthesis
- 5 A delta is formed when a _____ enters an ocean.
a. lake b. river c. mountain d. hill
- 6 The Nile River Delta has _____.
a. a fertile soil b. a triangular shape
c. an infertile soil d. a and b
- 7 A sand dune is formed by the _____ process, then the _____ process.
a. deposition - erosion b. erosion - weathering
c. erosion - deposition d. deposition - weathering
- 8 Sand grains in the desert can move forward or backward depending on the _____.
a. wind speed b. wind direction
c. water speed d. water direction
- 9 Which of the following factors helps in the formation of sand dunes?
a. Water b. Wind c. Light d. Heat
- 10 When a rock blocks the path of flying sand, a _____ may be formed.
a. dune b. river c. canyon d. delta

Put (✓) or (X):

- 1 The Nile River Delta has fertile soil that allows the cultivation of different crops. ()
- 2 A delta is formed when the speed of river water increases. ()
- 3 Plants of wetland and their roots don't affect the deposition process. ()
- 4 Silt carried by a river contains large bits of sand and clay. ()
- 5 Sand dunes are formed when a rock blocks water-blown sand. ()
- 6 Sand dunes may be found in a sandy desert or on a beach. ()
- 7 Sand dunes are formed by the deposition process only. ()
- 8 Sand grains are deposited on the same side of the rock where they are eroded. ()
- 9 Wind can't break down a rock. ()
- 10 Sand dunes are stable landforms that don't move. ()
- 11 The formation of sand dunes in the Eastern Desert in Egypt is due to the movement of wind. ()
- 12 Dunes are formed at the bottom of seas. ()

Write the scientific term:

- 1 Sediments carried by a river that contains sand, clay, and rock materials. ()
- 2 A fan-shaped land that is formed when a river meets a sea. ()
- 3 The sea in which Nile River Delta pours its water. ()
- 4 A process that causes the carving of rocks into different shapes by wind-blown sand. ()
- 5 The landform that is formed by the erosion and deposition of sand. ()

4

Complete the following using the words between the brackets
(deposition - canyon - fan - decreases - increases - delta)

- 1 A is formed by the erosion process, while a formed by the deposition process.
- 2 The Nile River Delta has a shape.
- 3 When the stream water speed it causes sediments.
- 4 When the force of blowing wind, the blown sand is carried for longer distance.

5

Choose from column (A) what suits it in column (B):

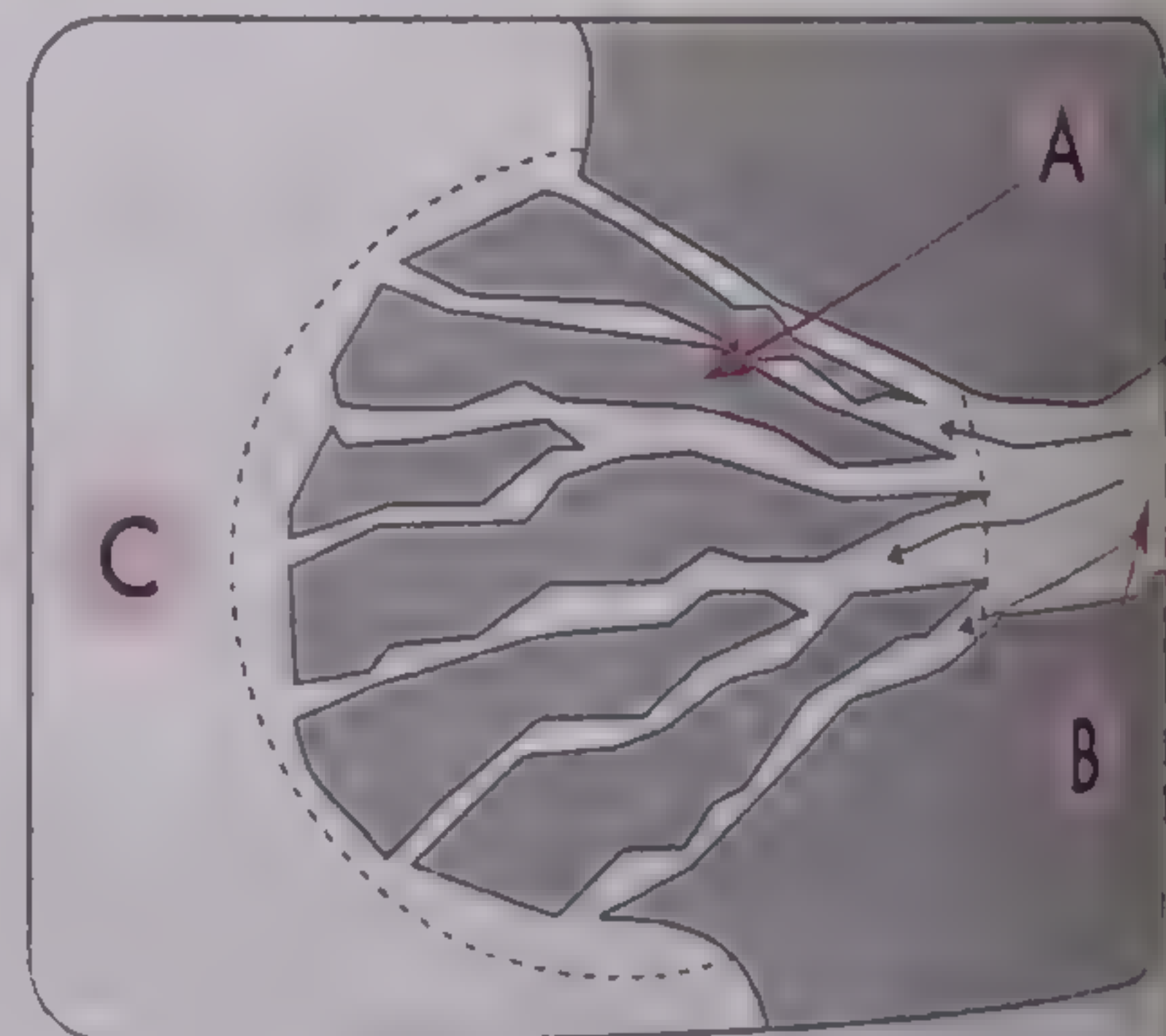
Column (A)	Column (B)
1 Erosion	a. is fine particles of clay, sand and rock materials.
2 Deposition	b. occurs when a stream water rushes quickly downhill a mountain.
3 Sand dunes	c. are hills of sand usually seen in groups and they may cover large areas.
4 Silt	d. occurs when a stream water speed slows down at the end of a river.

1 2 3 4

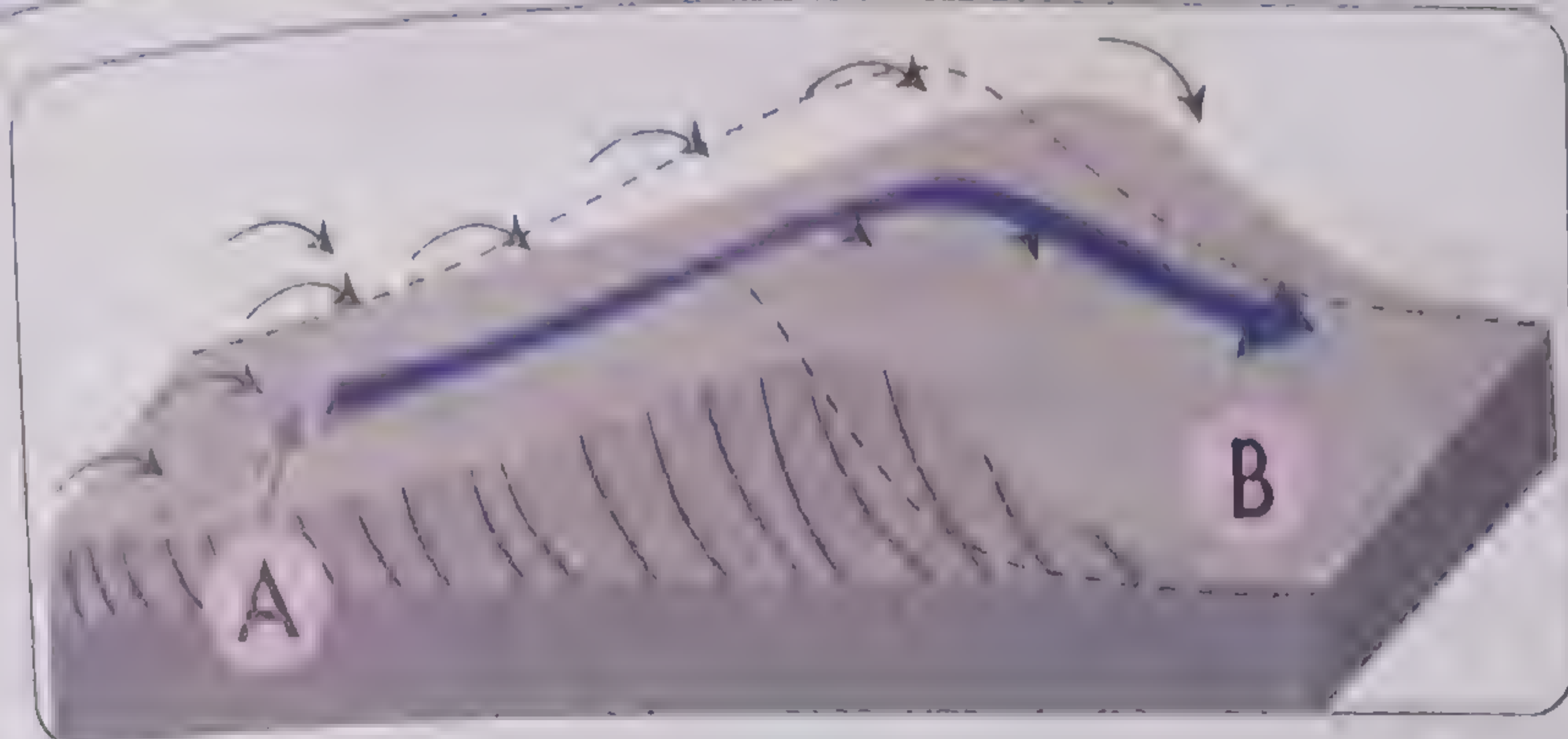
6

Study the following figure, then choose the correct answer:

- 1 The area (A) would become a (delta - canyon) due to the (erosion - deposition) process.
- 2 The (area "C" - area "B") could be a sea or a lake.
- 3 The (area "C" - area "B") is a river.



Study the following figure, then complete:



Erosion of sand occurs in area number

Deposition of wind-blown sand occurs in area number

Give reasons for:

1 Plants of wetland and their roots help in the formation a delta.

2 Silt carried by a river is deposited when the river enters the ocean.

3 Plants in wetland increase the deposition rate of silt carried by a river.

4 Sand dunes are formed in a desert.

What happens if?

1 A river carrying sediments meets a sea?

2 Wind-blown sand grains hit a big rock in desert?

3 Wind blows from South to North on sand dunes in a desert?

Model Exams

on Concept (4)

Model Exam / 1

Question 1

(A) Choose the correct answer:

- 1 Canyons can be formed in many ways, including
a. weathering only b. erosion only
c. weathering and erosion d. erosion and deposition
- 2 The shape of a rock gets worn and rounded by the effect of the process.
a. weathering d. deposition c. erosion d. photosynthesis
- 3 _____ are lowland areas in between mountains with gently-sloping sides.
a. Valleys b. Deltas c. Canyons d. Dunes
- 4 All the following are created by the water of rivers or streams, except
a. _____
a. delta b. canyon c. valley d. sand dune

(B) What happens if? A lot of rain falls on a small canyon?

Question 2

(A) Put (✓) or (X):

- 1 The sides of the canyon at the beginning of its formation are gently sloped. ()
- 2 A river may create a delta from sediments by deposition. ()
- 3 Dunes are formed at the bottom of seas. ()
- 4 Sand grains in the desert can move forward or backward depending on wind speed. ()

(B) Give a reason for: It is not safe to build a house close to a river. ()

Question 3

(A) complete the following using the words between the brackets
(more - delta - sand dune - less - sediments)

- 1 When a rock blocks the path of flying sand, a _____ may be formed.
- 2 A _____ is formed when a river carrying _____ enters an ocean.
- 3 A small stream causes _____ erosion than a large river.

(B) Write the scientific term:

A special type of valleys with steep sides. ()

Model Exam 2

Question 1

(A) Choose the correct answer:

- Which of the following factors helps in the formation of sand dunes?
a. Water b. Wind c. Light d. Heat
- A canyon may take _____ of years to be formed.
a. hundreds b. tens c. millions d. couple
- All the following factors affect the shape of the valley, except the
a. river's size b. river's speed c. rocks' type d. rocks' color
- If the rain falls over a canyon several times per year, _____
a. its depth increases b. its depth decreases
c. it becomes flat d. it isn't affected

(B) Write the scientific term:

The two processes that cause the formation of canyons. (_____)

Question 2

(A) Put (✓) or (X):

- Wadi Nakhar is a type of V-shaped canyons. ()
- When a river moves downhill on a steep slope, its speed decreases. ()
- Both canyons and valleys often have rivers at their bottoms. ()
- Sand dunes can be seen separately and cover a small area. ()

(B) Cross out the odd word: Canyon - Valley - Gravity - Sand dune

Question 3

(A) Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 Sand dunes	a. are lowland areas between mountains with gently-sloped sides.
2 Valleys	b. they are formed by erosion and deposition.
3 Canyons	c. are fine bits of clay, sand, and rock materials.
4 Silts	d. are landforms that have steep-sloped sides.

(B) What happens if? A river carrying sediments meets a sea?

1 Choose the correct answer:

1. When a rock's surface is eroded due to weather factors, such as water, this indicates the occurrence of
 a. weathering b. deposition c. transfer d. erosion
2. Dissolving metals and forming rocks is an example of
 a. mechanical weathering b. weathering by wind
 c. deposition in rivers d. chemical weathering
3. Which of the following indicates the occurrence of a chemical weathering process?
 a. Water freezes inside cracks in rocks.
 b. Mixing the acidic water with rocks.
 c. Trees' roots grow inside cracks in rocks.
4. What is the process in which the landforms change due to weather factors?
 a. Expansion b. Weathering c. Erosion d. Evaporation
5. When rocks are broken down into small pieces, this indicates the occurrence of process.
 a. mechanical weathering b. chemical weathering
 c. erosion by wind d. erosion by water
6. Which of the following is evidence of erosion?
 a. Sand dunes formation b. Forming rock crumbs
 c. Nile delta formation d. Forming of sedimentary rocks
7. The formation of a red-rust layer in sedimentary rocks is evidence of the occurring of process.
 a. erosion of sedimentary rocks b. mechanical weathering
 c. chemical weathering d. transfer and deposit of crumbs
8. Steep valleys formed due to flowing water erosion are called
 a. canyons b. sand dunes c. hills d. deltas

- 9 The formation of sand dunes in the Eastern Desert in Egypt is due to the movement of
- a. floods b. wind c. waves d. torrents
- 10 At the convergence of flowing river water that carries clay and sand sediments with the sea, a landform called a is formed.
- a. delta b. sand dune c. dam d. canyon
- 11 Which of the following landforms is steep and formed due to the power of flowing water erosion?
- a. Plain b. Valley c. Canyon d. Mountain

2 The following are photos of landforms. Each of them is evidence of the occurrence of a geological process. Connect each process with its evidence of occurrence:

Erosion by water



Deposits of rivers



Erosion and deposition due to wind



Glossary

Unit 3 – Concept 1 (Devices and Energy)

Lesson (1)		طاقة	Convert
Devices	الأجهزة	Energy	Mars Curiosity Rover
Technology	تكنولوجيا	Remote-controlled cars	سيارات تعمل بالتحكم عن بُعد
Solar panels	الألواح الشمسية	الموارد	Transform
Truck	شاحنة	طائرة	Boat
Operated remotely	تعمل عن بُعد	مهام	Turning corner
Battery	بطارية	يخزن	Chemical energy
Sensors	مستشعرات	الطاقة الكهربائية	Sound energy
Run out	ينفذ	Recharge	Replace
Spacecraft	مركبة فضائية	Missions	Socket/Plug

Lesson (2)		الطاقة المستهلكة	Produced energy
Consumed energy	الطاقة المستهلكة	Input energy	الطاقة الناتجة
Output energy	مخرجات الطاقة	Hairdryer	مجفف شعر
Movement	حركة	Clapping	تصفيق
Growth	نمو	Convert	يتحول
Burn	حرق	Release	ينتج
Remains	بقايا	Electrical cords	أسلاك كهربائية
Copper	نحاس	Leaks out	يتسرب
			Soap dispenser
			Rubbing your hand
			Wood
			Coal
			Electrical wire

Lesson (3)		طريق	Approach
Friction	احتكاك	Road	يتقرب
Disappear	يختفي	Form	يشكل
Electric bulb	مصباح كهربائي	Washing machine	غسالة
Determine	احسب	Record	سجل
Mixer/Blender	خلاط	Warming	التدفئة

Lesson (4)		تتبع مسار الطاقة	Cell phone (Mobile)
Energy flow	مسار الطاقة	Track energy pathway	التيهون المحمول
Vibrations	الاهتزازات	Job/Function	وظيفة
Noise	ضوضاء		Lost

Unit 3 – Concept 2 (About Fuel)

Lesson (1)		فحم	Natural gas
Oil	زيت	Coal	غاز طبيعي
Fossil fuel	الوقود الحفري	Extract	يستخلص
Pointer	مؤشر	Operate	يشغل
			Underground
			Means of transportation

Lesson (2)

Conceptual	مفاهيم	Release	لتج	Biofuel	الوقود الحيوي
Renewable	متجدد	Renewable	متجدد	Corn	الذرة
Ancient	قديم	Ancient	قديم	Charcoal	فحم نباتي
Require	يتطلب	Require	يتطلب	Deforestation	إزالة الغابات
Remains	بقي	Remains	بقي	Require	يتطلب
Conserve	يحفظ	Conserve	يحفظ	Settle on	استقر على
Sea creatures	كائنات بحرية	Sea creatures	كائنات بحرية	Cover	يغطي
Rocks	صخور	Rocks	صخور	Run out	ينفذ
Available	متاح	Available	متاح		

Lesson (3)

Regions	المناطق	Candle	شمعة
Unplug	افصل الجهاز عن المقبس	Appliances	الأجهزة
Generators spin	تدور المولدات		

Lesson (4)

Industry	صناعة	Agriculture	الزراعة
Pesticides	مبيدات حشرية	Irritation	تهيج
Lungs	الرئتان	Damage	يضر
Global warming	الاحتباس الحراري	Combine	يتحد

Unit 3 – Concept 3 (Renewable Energy Resources)

Lesson (1)

Windmills	طواحين الهواء	Watermills	طواحين المياه	Pipes	أنابيب
Machines	الآلات	Mill's blades	شفرات الطاحونة	Grind the grains	طحن الحبوب
Flour	الدقيق	Cost	تكلفة	Blow	تهب
Function	وظيفة	Old windmills	الطواحين القديمة	Modern turbines	التوربينات الحديثة
Sunrays	أشعة الشمس	Radiant energy	الطاقة الإشعاعية	Atmosphere	الغلاف الجوي
Greenhouse	الصوبة الزراعية	Farmers	المزارعون	Crops	محاصيل
Climate	مناخ	Concave mirrors	المرايا المنحنية	Collect	تجمع
Solar panels	الألواح الشمسية				

Lesson (2)

Irrigation equipment	معدات الري	Generator	المولد
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Lesson (3)

Dams	السدود	Evaporation	عملية التبخر	Condensation	عملية التكثيف
Pinwheel	مروحة ورقية	Water cycle	دورة المياه	Refill	إعادة تعبئة

Unit 4 – Concept 1 (Breaking Down and Moving Rocks)

Lesson (1)

Break down	تكسير
Wind blow	نهب الرياح
Sand dunes	الكثبان الرملية
Collision	تصادم
Canyon	الأخدود

Weather change	تغيرات مناخية
Wear away rocks	تفتيت الصخور
Footprints	آثار الأقدام
Coastal rocks	الصخور الساحلية
Steep	منحدرة

Landscapes	المناظر
Weathering	التجوية
Sandcastle	القلعة الرملية
Needle	إبرة

Lesson (2)

Erosion	التعرية
Pebbles	حصى
Rust	صدأ
Enormous	ضخم
Boulder	صخرة كبيرة
Limestone	الحجر الجيري

Deposition	الترسيب
Statue	تمثال
Decide	يقرر
Sand rushes	اندفاع الرمل
Dissolve	تذوب
Element	عنصر

Rushing water	ماء جار
Peeling on a building	تقشير على المبنى
Evidence	دليل
Sandpaper	الورق الصنفرة
Cave	كهف
Lichens	الطحالب

Lesson (3)

Antacid tablet	قرص مضاد للحموضة
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Dissolution	تحلل
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Exposed to	معرض لـ
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Lesson (4)

Erode	يتآكل
Farmland	الأراضي الزراعية
Landslides	الانهيارات الأرضية
Sediment	رواسب
Settling	استقرار

Beach	شاطئ
Flash floods	الفيضانات المفاجئة
Creek	ممر مائي
Mud	طين
Western Desert	الصحراء الغربية

Deposition	ترسيب
Hurricanes	العواصف
Picks up	أخذ
Remains	يبقى
Peninsula	شبه جزيرة

Unit 4 – Concept 2 (Changing Landscapes)

Lesson (1)

Factors	عوامل
Clues	أدلة
Deep	عمق

Impression	أثر
Worn rock	صخرة متآكلة
Valley	وادي

Evidence	دليل
Slope	انحدار - ميل

Lesson (2)

Cracks	شقوق
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Patch of mud	رقعة من الطين
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Lesson (3)

Streams	جداول مياه
Steep slope	منحدر شديد الانحدار
Lowland	أرض منخفضة

Landforms	تضاريس
Layers	طبقات
Flat plain	سهل منبسط

Carve	نحت
Sediments	رواسب
Vertical walls	جدران رأسية

Lesson (4)

Silt	طمي
Waterland	أرض رطبة

Still water	مياه ساكنة
Barrier	حاجز

Particles	جزيئات
Fertile soil	أرض خصبة

Lesson (5)

Wind direction	اتجاه الرياح
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Wind force	قوة الرياح
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